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LIMITATIONS OF SLITLAMP MICROSCOPY OF THE LIVING EYE AND THE POSSIBILITY OF OVERCOMING THEM.

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ROCHESTER, N. Y.

Translated from the German by Dr. Clarence King, Cincinnati, Ohio.

The magnifying power of the double microscope objective is limited by the distance it must be kept in front of the eye and the need of getting as large an aperture as possible. Higher power oculars make the image larger but do not help definiteness or resolution of detail. Transillumination cannot be so perfect as with the microscopic slide. Optical defects of the surfaces and media of the eye cannot be overcome. The physiologic oscillation of the eye makes useless higher powers than those now employed. However, the field for this instrument may be extended by using polarized light, the illumination for ultramicroscopy, the working out of diffraction phenomena in the living tissues, studies of fluorescence by ultraviolet light and spectroscopy. An address delivered before the Cincinnati Ophthalmological Club May, 1925.

The investigator, eager to penetrate deeper and deeper into the wonderland of microscopy of the living eye with the Gullstrand Slitlamp, is confronted with certain optical and mechanical limitations which cannot be overcome by the usual methods of examination with this instrument and which, relatively early, frustrate all efforts to gain a further insight into the microcosm of the living eye. The disclosures of stereomicroscopy with the slitlamp have greatly enhanced our knowledge of, not only the anterior parts of the eye[1], but also of the posterior vitreous, as well as of the fundus and the angle of the anterior chamber[1]. Nevertheless, in all these investigations certain disturbing factors are encountered, which stand in the way of further progress of our knowledge of the intravital histology of the living eye. In the following pages, it is proposed to consider these hindrances, and finally to inquire into the possibilities of the means by which we may be able to discover some of the histologic data which now lie beyond our knowledge.

I. LIMITATIONS OF THE USUAL SLITLAMP MICROSCOPY AND NATURE OF DISTURBING FACTORS WHICH DETERMINE THEM.

The limitations of the usual slitlamp microscopy from the cornea to the retina in natural light are determined by the following four disturbing factors:

A. The focal distance, as well as the aperture of the double or single objective employed in slitlamp microscopy, is limited and cannot be diminished at will.

B. Slitlamp microscopy of the living eye is principally concerned with observation by direct illumination. Actual microscopy with complete transillumination, in accordance with the theory of the microscope, cannot be strictly realized.

C. The media of the living eye present, optically, neither a centered system nor an even partially corrected system; and are subject to the chromatic, spherical, and astigmatic aberrations of the various orders. Besides, the living ocular media are not homogeneous structures, but possess a lattice space structure.

D. The physiologic oscillation of the living eye causes, above a certain degree of total magnification, an increasing instability of the observed region which, with still higher magnification, makes observation of finer histologic details impossible. We will examine in succession these four disturbing factors in exact observation and proceed to the following considerations:

A. *The focal distance cannot be diminished.* Upon purely mechanical grounds it is not practicable, in employing the double objective for the corneal microscope, to bring the optical centers

of the two converging objective systems closer together without decreasing the diameter of the two objective openings to such a degree that the intensity of the direct light, falling upon the examined eye and reflected from the ocular structures, is greatly diminished. This consideration applies to the most powerful, hitherto employed, double objective "F. 24 mm." of Bausch and Lomb (F. W. D. (free working distance 26 mm.), as well as the corresponding double objectice "a_3" of (Zeiss F. W. D. 3°) Every further increase of the objective magnification, that is to say, each shortening of the focal distance, is accompanied by a decrease in the two objective openings, and therewith a corresponding diminution of the *available numerical aperture*. Correspondingly, the light intensity of the observed slitlamp image is lessened; also the clearness of the intravital histologic ocular image is diminished; and thereby on this account, the recognition of finer tissue detail meets with more or less interference.

Here the use of the single objective, as in my ocular microscope constructed by Zeiss, and by Bausch and Lomb, brings us a step further. The employment of the single objective, designed originally for slitlamp microscopy of the fundus and the chamber angle, affords the possibility, by avoiding the double objective openings, of correspondingly diminishing the focal distance and therewith the free working distance of the single objectives employed for stereomicroscopy. This effect has been accomplished by the introduction of the single objectives, F 24 mm. of Bausch and Lomb (F. W. D. 26 mm.) and aa of Zeiss (F. W. D. 14 mm.). Nevertheless, we early encounter an obstacle which cannot be overcome, for the further approximation of the objective, with corresponding diminution in the focal distance and accompanying increase in the objective magnification, leads to contact with the lashes of the patient and to soiling the objective. This contact takes place at approximately 12 mm. distance from the corneal apex. All stronger objectives than A of Zeiss, for example, are useless. The above mentioned difficulty connected with the diminution of the focal distance of the objective employed in slitlamp microscopy cannot be overcome by using stronger oculars.

The resolution of the finer details of the observed tissue is *essentially a function of the numerical aperture of the objective employed* and independent of the ocular magnification. It is, therefore, no advantage to further and further increase the ocular magnification used with a given objective. An increase in ocular magnification magnifies the image formed by a given objective, but does not cause an increase in resolving power. This fact should be kept in mind by the slitlamp microscopist, and is, therefore, again emphasized. Whoever wishes a further *effective* increase in the magnification of his corneal or ocular microscope must use, necessarily, a correspondingly higher power objective, with correspondingly greater numerical aperture, and not merely a stronger ocular. Based upon these considerations, the conclusion may be drawn that, for the ordinary slitlamp examination of the living eye from the cornea to the retina, the double objective F24mm. of Bausch and Lomb, and respectively the double a_3 of Zeiss, in combination with the appropriate ocular magnification, affords the highest and most effective resolution of finer histologic details, and that thereby magnification is attainable as indicated in the following combinations:

	Bausch & Lomb	Zeiss
Double Objective	F24mm	a_3
Ocular	12.5x	6x
Linear Magnification	105x	108x

To obtain the actual or total magnification of an object observed within an eye, it is necessary to multiply this effective magnification of the microscope by the amount of the socalled self magnifying power of the observed living eye. This self magnification, the result of the curvature of the media, assuming a normal, emmetropic eye, is computed as follows:

	(Self Magnification)
Region of the posterior corneal surface	SM = ab. 1.1x
Region of the middle of the anterior chamber	SM = ab. 1.2x
Region of the anterior surface of the lens	SM = ab. 1.3x

Region of the middle lens .....SM = ab. 1.5x
Region of the posterior lens surface .....SM = ab. 1.7x
Region of the middle vitreous .....SM = ab. 1.9x
Region of the retina and nerve papilla seen thru the contact glass of Koeppe .....SM = ab. 0.95x
Region of the chamber seen thru the contact glass of Koeppe .....SM = ab. 3.0x

In hyperopia or myopia these values are correspondingly changed, assuming that alterations in the curvature of the media play a role.

One obtains the true or total magnification for every point in the observed eye by multiplying the magnification of the microscope by the figure of the corresponding self magnification of the observed eye. This total magnification amounts for the usual slit lamp examination (middle of the vitreous at the highest) to about two hundred times.

While in this way we obtain as maximal available total magnification for the chamber angle the value of 40 and for the fundus that of 60, the use of the single objective aa of Zeiss in combination with the ocular 6 provides a magnification of 160 for the cornea. We, therefore, must regard the double objectives, F24mm. of Bausch and Lomb and a_3 of Zeiss, as well as their single objectives for slitlamp examination with the corneal or ocular microscope as the most powerful available objectives.

B. *Impossibility of slitlamp microscopy in full transillumination.* Thruout the entire microscopy of the living eye from the cornea to the fundus, unfortunately we cannot utilize transillumination as we do with the ordinary microscopy in examining inanimate objects. To be sure, some of the light proceeding from the light source is reflected from the mirror like boundary surface and serves as transilluminating light. This we designate as negative light field illumination. I recall in this connection the reflex microscopy of the corneal endothelium and the anterior and posterior lens shagreen. When the cornea, for example, is examined in diffusely reflected light from an area of the iris which has been focally illuminated, negative light field illumination is obtained. Here the light available for examination is much less than in reflex microscopy. In any case, the conditions are far more favorable with the ordinary microscope, as we have at our service the rays from the light source which enter the full circumference of the condenser system. We have no way to overcome or improve this lack in the microscopy of the living eye; and are more or less dependent on the light which directly falls on the ocular tissues and which is more or less completely reflected from them. Therefore, in the fullest sense, only direct lighting is available in slitlamp microscopy.

C. *Influence of chromatic, spheric, astigmatic, and diffractive oberrations of the living eye.* A third further disturbing factor for microscopy of the living eye with higher magnification is provided by the various chromatic, spheric, astigmatic, and diffractive aberrations in the living ocular media. While all these sources of error are practically negligible for the corneal surface, or the anterior corneal layers, their disturbing influence becomes more and more noticeable the deeper we wish to penetrate into the investigation of the histology of the living eye; for the media of the living eye present neither a centered nor an even approximately chromatically, astigmatically, or spherically corrected system, and are encumbered with the aberrations of the various orders. This applies also to the use of either chromatically or astigmatically corrected contact glasses for examination of the angle of the anterior chamber or the fundus.

To optically correct these aberrations is impossible, as the amount of the specific aberrations is unknown. This applies especially to the view thru the cornea in microscopy of the chamber angle, aside from the lessened peripheral transparency of the cornea. The high grade of chromatic and spheric aberration in the living ocular media is recognized in the numerous articles dealing with the subject in the international literature. Likewise, Gullstrand has shown the influence of astigmatic aberration of the various orders upon the dioptrics of the

living ocular media. Above all, the chromatic and spheric aberrations in the cornea and lens, as well as the astigmatic errors in these systems, are disturbing. A part of the aberration, especially the astigmatic aberration of the various orders, is to be ascribed to the nonspherical deformation of these structures; for, as I have indicated elsewhere[2], the two corneal surfaces, as well as the lens surfaces, regarded from the viewpoint of analytic mechanics, approximate very closely the rotation body of the socalled catenary, and cause certain disturbing aberrations in all rays which fall more or less close to the central axis.

In addition, we have to contend with the nonhomogeneous character of the ocular media, and especially with the lens arranged in layers with their variable refractive indices. Another especially disturbing influence in the tissue of the cornea and the lens is brought about by the lattice space arrangement arising from the histologic structure of these tissues. This phenomenon has been exhaustively discussed in my treatise[3] on the subject. In these two space lattices there occurs, as a consequence of the diffraction of the light, many additional aberrations, which are added to those due to astigmatism (Gullstrand). That the aspheric and various astigmatic refractive anomalies of the living eye further complicate these relations, is evident. This applies especially to all forms of hypermetropic and myopic astigmatism.

D. *The physiologic oscillation of the living eye.* The last, and not the least significant disturbing factor, arises from the physiologic unrest of the living eye. As the microscopy of the living eye indicates, this instability appears with relatively low magnification (that is, at about 50); and becomes so decidedly disturbing with higher degrees of magnification (about 200 total magnification), that it is not possible to contemplate any further increase of magnification. This instability manifests itself as fine oscillating variations, of a clonic character, of the living eye from the position of rest. These oscillations represent the antagonism of the various muscle forces which hold the eye in a position of rest. The amount of these oscillations of the living eye varies relatively markedly from case to case. Now and then cases are encountered in which there is a greater ocular stability, and in them to a certain extent the influence of this disturbing factor is lessened.

II. EXTENSION OF THE LIMITATIONS TO OBSERVATION WITH THE GULLSTRAND SLITLAMP.

It is now proposed to inquire whether and to what extent it is possible, by avoiding the four above mentioned disturbing factors, to penetrate deeper and deeper into the microcosm of the living eye, and so further overcome the limitations to our knowledge. To attain this end the following procedures are available:

1. The stereomicroscopy of the living eye in polarized light of the slitlamp.
2. The stereoultramicroscopy of the living eye with the slitlamp.
3. The differentiation and interpretation according to the theory of diffraction of the living intraocular lattice structures resolvable with the Gullstrand slitlamp.
4. The fluorescent or ultraviolet light microscopy of the living eye with the slitlamp.
5. The spectroscopy of the living eye with the slitlamp.

1. *Stereomicroscopy of the living eye in polarized light with the slitlamp.* I have exhaustively described the requisite optical and technical aids for stereoscopic polarization microscopy of the living eye; and I refer the reader who is especially interested in the optical and technical details of polarization and analyzation of the light in observation with the slitlamp to my treatise on the subject.[4] I will content myself at this time with the observation that the light of the slitlamp is polarized by a Nicol prism, which is placed before the slit; and that observation is carried on by a second Nicol prism, which is placed immediately behind the single objective of the microscope, fitted with a thin mica plate to retard $\frac{1}{4}\lambda$. The microscope is furnished with two stereoscopic oculars and affords stereoscopic perception of the observed tissue despite the single objective. It has been constructed according to my design by Zeiss and later by Bausch and Lomb.

Using a nitra lamp with hypervoltage, or an arc lamp, and employing the various opposing rotations and adjustments of the polarizer and analyzer, as well as the thin mica plate, with the ordinary magnification of the slitlamp, numerous new phenomena can be studied which are not perceptible in the ordinary examination.

This procedure represents a great advance upon the former usual slitlamp methods. Thus, with appropriately crossed Nicols, the intralamellar system of the cornea, or the socalled cement line system, can be observed. This system appears as a network of dark lines which cross each other at about right angles, and which appear to radiate at certain angles from the corneal margins and to become confluent as peculiar radiating figures in the center of the cornea. The assumption lies close at hand that the substance corresponding to these lines is optically isotropic, that is, singly refractive or doubly refractive with radial axes. Also in this way the statomechanical structure of the cornea is revealed. For this examination it is advantageous to use as a light reflecting background, the shagreen of a normal or cataractous lens. Further, it follows from these observations that the living substantia propria of the cornea may be doubly refractive, as the result of the one sided intravital pressure from the anterior chamber. To this must be added perhaps a certain genuine double refraction in keeping with the newer interpretations of tissue structure as crystalline structures, according to Ambronn, Siedentopf, Wiener, and others.

Observations in polarized light indicate that corneal cloudiness in glaucoma is not due to anisotropic character of the corneal substance but must be looked upon as a consequence of an inflammatory tissue saturation (Fuchs). Further, it must be remarked that the living corneal nerves appear white with parallel Nicols and black with crossed Nicols. In that way the nerves are seen to be more frequently medullated than with the natural light of the slitlamp. Moreover, the nerve substance, as well as the sheaths in the living corneal nerves, is to be regarded as either optically singly or doubly refractive, with radially disposed axes.

Because of the fact that in polarized light the interfascicular cement lines are visible, it becomes possible to see the living corneal fibers as such; that is, as tissue elements lying between the cement lines. Furthermore, it is interesting that Bowman's, and Descemet's membrane, display in polarized light certain polarization colors, which reveal the location of the two membranes, but not the membranes themselves. This fact is all the more remarkable as both transparent and optically obsolutely homogeneous membranes remain completely invisible with the usual slitlamp methods.

An intensely interesting field for study is found in the finer and denser corneal scars. By using the shagreen of the normal or cataractous lens, thus providing a negative light field, and by appropriately adjusting the analyzer and polarizer and thin mica plate in opposite positions, it is possible to see the substance of such scars, as well as the more or less normal surrounding cornea, in complementary colors. These polarization colors, caused by interference in the polarized light in the scar tissue, display all color tones; and by means of the optical coloring of the living tissue, the form and extent of the fine corneal scars are rendered visible earlier and more clearly than with the usual method. So, for example, fine, more central or peripherically situated scars can appear in a wonderful blue color, while the remaining cornea surrounding the scar can appear green or reddish yellow. Or the scar may appear green or red in all its finest extensions, while the remaining cornea appears in complementary colors. At all events, the optical coloring of superficial or deeper corneal scars, in the polarized light of the slitlamp, is a new and brilliant method for demonstrating the finer structure, form, and extent of the corneal scars, which can ordinarily be differentiated only with difficulty.

In addition, it is very important from a diagnostic standpoint that transparent foreign bodies, as glass splinters embedded in the cornea, after healing can be easily differentiated from structures such as Bowman's or Descemet's mem-

brane; for it is known not only that after injury of the living cornea by glass splinters, tears in Bowman's or Descemet's membrane, accompanied by the formation of hyalin material in this membrane remain visible, but also that glass splinters in the process of healing can remain imbedded in every part of the cornea. After a corneal injury by glass, one must frequently decide whether he is dealing with a healed-in glass splinter or with a fissure of Bowman's or Descemet's membrane. By a properly opposed adjustment of the analyzer and polarizer and thin mica plate, and especially by crossing of the analyzer and polarizer, we can cause a maximal darkening of the area in question if it is a glass splinter.

On the contrary, the tissue examined remains light when we are concerned with newly formed, doubly refractive hyalin substance. I recall such a case, which was presented during my slitlamp course at Knapp's Hospital in New York, and in which a diagnosis of healed-in glass splinters in the cornea was made with the aid of polarized light. For just as the substantia propria of the cornea, as well as that of Bowman's and Descemet's membranes, is intravitally doubly refractive and appears bright in every opposed adjustment of the analyzer and polarizer, so every singly refractive substance, as healed-in glass particles, shows maximum darkening with crossed Nicols, which serves to identify it.

In the region of the crystalline lens similar interesting phenomena can be studied when we employ polarized light. Thus, it is possible to outline the individual lens fibers for the same reason that it is feasible to render visible the fiber borders and the fiber cement lines of the cornea; for the cement substance between the fibers of the lens is also optically single, or with doubly refractive radial axes. On account of this, the cement lines of the lens appear more prominent with crossed Nicols and afford a greater contrast between the individual lens fibers. We can trace, therefore, in polarized light the course of the lens fibers between the lenticular sutures to a further extent than with ordinary slitlamp illumination. In the anterior and posterior lens capsule similar color phenomena, as in the region of Bowman's or Descemet's membranes, can be determined.

On the other hand, it was not possible to recognize this microscopic polarization color phenomenon behind the lens capsule in the region of the surface of the vitreous. From this fact I draw the conclusion that in the region of the living vitreous surface no membrane exists, but rather a fine fibered limiting meshwork. This conclusion implies abandoning the idea of a hyaloid membrane, even tho the impression as to its existence is deeply rooted. If we had here a structureless, homogeneous membrane, we would expect, in consideration of its great thinness and surface tension, a marked display of color phenomena in microscopy with polarized light. However, this is not the case, so we must have on the surface of the vitreous a fine meshwork, which, on account of its fineness is disposed to fulfill the same protective function as a structureless membrane. Also in case of aphakia and prolapse of the vitreous into the anterior chamber, a membrane of sufficient fineness cannot be optically differentiated from a structureless, homogeneous, limiting membrane.

Anatomic determinations on hardened and dead vitreous material are not conclusive; as in the removal and conserving, as well as embedding, the most pronounced alterations and coagulation of the superficial vitreous tissue are unavoidable. This applies not only to the anterior vitreous layers, but also especially to the network of vitreous fibers proper. It is possible by employing polarized light in the tissue depths, to render visible in certain cases the living conjunctival nerves on account of the pronounced clarifying effect of polarized light. This possibility depends upon the fact that the visibility of structural directions, which do not approximately correspond with the plane of oscillation of polarized light, is apparently reduced to nil when the Nicols are crossed. Demonstration of the nerves of the living conjunctiva without employing polarized light has succeeded by artificially coloring the conjunctiva. (Knuesel and others.)

II. STEREOULTRAMICROSCOPY OF THE LIVING EYE WITH THE SLITLAMP.

That it is possible, by avoiding the four above discussed disturbing factors, to extend the slitlamp microscopy of the living eye into the domain of ultramicroscopy, I have shown in my researches pertaining to the subject in my treatise.[4]

Ultramicroscopy of the living eye with the slitlamp depends on the fact that especially by one sided illumination, by which the object observed appears light upon a dark background (cornea, anterior chamber, vitreous), the visibility or invisibility of linear objects is determined by an established azimuth law.* If point like objects, which have a smaller diameter than half the mean wave length of the light, (for example, the finest dust like opacities in the cornea, anterior chamber, lens, or vitreous), are in question, we speak of point like ultramicroscopic objects. These objects deflect the light which falls upon them as socalled spherical waves, which are propagated in every direction in space, and which form an image in the image plane of the microscope, uninfluenced by the place, illumination, and direction of observation of the object. Thereby, the latter appear as white or colored, ill defined diffraction discs. If the objects examined possess microscopic dimensions in one direction, we are concerned with linear ultramicroscopic objects.

In order that such linear objects may be visible in the image plane of the microscope, certain essential conditions must be fulfilled. As mentioned above, when light impinges upon the object (in this case, a linear, ultramicroscopic object) secondary light waves which are conical in shape are formed by diffraction. We can construct a figure around the object representing reciprocal cone like waves. It has been determined that in order that such linear objects may be visible in the image plane of the microscope, the long axis of the linear object must be the axis of the light wave cone and that the illuminating ray must be the surface ray of such a light wave cone, and finally that the wave cone arising from the light diffracted by the object must intersect the aperture cone of the microscope used for observation. This rule applies for the tangents to the contours of bent, linear objects at any given observed point. In this way, the dependence of the visibility of the linear objects in focal slitlamp illumination upon the relative azimuth of the light incident at the time is established for all ocular media, independently of the situation of the axis of the microscope. We are concerned here mostly with the diffraction of cylindrical or conical waves.

Above all, positive dark field illumination can be attained in the living cornea by means of a ring shaped contact glass which consists of two chambers that have the shape of truncated cones. The dividing lines of these truncated cones is silvered. The pencil of the light incident to the glass is reflected by the silvered surface in such a way that a pointed pencil of light is visible in the interior of the cornea exactly perpendicular to the microscopic axis which renders an intracorneal object visible in dark field illumination with the illuminating rays perpendicular to the axis of observation. Ultramicroscopic linear objects never appear sharply defined but rather more or less indefinite in the shape of white or colored diffraction bands depending on whether, as in the diffraction discs, white or monochromatic light is employed. Such linear objects appear in the living ocular media as the very finest fiber outlines, delicate fissures in the tissues, or needle like bodies.

Further, in connection with the analyzer microscope, the socalled dichroic color phenomena can be seen in crystals, which are occasionally encountered within the intraocular media. Similar analysis can be valuable as a means of differential diagnosis of similar objects and especially for the differentiation of the color appearances of other ultramicroscopic objects, caused by the object absorbing more or less of certain wave lengths of

*This azimuth law states essentially that the angle between the axis of illumination and the direction of the linear object cannot be optional but must amount to definitely or approximately 90° in order to render this object visible.

the incident light. This applies to the recognition of the polarization state of the light diffracted from the fine tissue particles of the living eye.

In regard to the objective color phenomena occasionally visible in the living ocular media, especially in the lens, I refer to my treatise dealing with the subject of the lattice or grating structures of the living eye.

3. DIFFERENTIATION AND INTERPRETATION, ACCORDING TO THE THEORY OF DIFFRACTION, OF LIVING INTRAOCULAR LATTICE STRUCTURES, RESOLVABLE WITH THE GULLSTRAND SLITLAMP.

Thru slitlamp microscopy of the living eye, it has been established as a fact that the intraocular structures, especially the refractive media, represent typical diffraction gratings whose optical effect is apparent objectively for the observer, as well as subjectively for the patient himself. I have discussed the nature and function of the intraocular lattice like structures, partly mathematically and partly from the view point of physiologic optics, in my treatise upon the subject[3]. I should like to confine myself at this time to a discussion of the essential results of this interesting investigation from which the great significance of this problem arises.

The diffraction of light in the intraocular diffraction gratings, especially in the more or less uniform, yet many shaped space lattices, represented by the lymph system of the cornea the radial fiber system of the lens, as well as the crisscross fiber system of the vitreous, gives rise to the subjective phenomena of the variegated color rings, which surround sources of light. We are concerned here with the deduction to be made from the relative angular distance of the colored diffraction rings surrounding a light source, and the size and the intervals of the fine tissue structures which give rise to such colored rings. The slitlamp affords the first possibility of measuring the finer microscopic structures of the living eye, and thereby numerically solving the problem of the colored rings.

In edema of the corneal epithelium, in inflammatory and diffuse corneal opacities, in deposits on the posterior corneal surface, in lenticular cloudiness and in manifold vitreous opacities, the elements are unequal in size; and at varying intervals they provide tissue gratings which are not uniform and which cause only a diffuse areola around a light source. In conjunctivitis, or when finely triturated ointment is introduced into the conjunctival sac, rings with an angular radius of 1.25° to 2.50° can appear in red. Corneal rings caused by the diffraction of the intralamellar lymph system have an angular radius of 1.5° to 1.75°. The intervals of the lymph space intersections, which are to be held chiefly responsible for the diffraction effect in the cornea, have been fixed at 0.04 mm. in size. These rings occur physiologically in the corneal edema of noninflammatory glaucoma and in conjunctivitis.

The colored rings arising from the lattice structure of the lenticular fibers have an angle radius of 3.5° to 4° in red. The glaucomatous colored rings have as a rule an angle radius in red from 5.50° to 8°. These rings cannot be caused by the intralamellar lymph cloudiness of the cornea, as the radius of these rings must amount approximately to 1.75°. Here the lattice space structure of the living vitreous tissue acting as a diffraction grating must alone be considered as the cause. Calculation based on the mean intervals of neighboring vitreous fiber intersections results in a value of 7° for the rings which correspond to such intervals. We are forced to assume that in attacks of increased intraocular pressure the vitreous network becomes more markedly cloudy and in this way causes the large colored rings observed subjectively in glaucoma.

4. FLUORESCENT OR ULTRAVIOLET LIGHT MICROSCOPY OF THE LIVING EYE WITH THE SLITLAMP.

After the living human eye had been investigated with the visible light of the slitlamp, the thought lay close at hand that it might be advantageous to widen the domain of inquiry and utilize invisible light and especially the ultraviolet light. As practical experience

teaches us, we can in this way observe many interesting and important phenomena, which would escape our notice when employing the slitlamp with visible light. The fluorescent or ultraviolet light microscopy of the living eye with the slitlamp depends, as in the analogous method with the ordinary microscopy with inanimate objects, on the fact that the short wave, visible or invisible, ultraviolet light is so altered by certain chemical substances that the wave length of the light, which is more or less diffusely thrown back, receives a greater or less addition, so that the object examined glows with a green or yellowish or reddish light when it is illumined by visible short wave lengths or invisible ultraviolet rays.

We can divide, according to Schanz, the total ultraviolet rays into the so-called outer ultraviolet, which includes the total short length rays up to 300$\mu\mu$, and the inner ultraviolet, which represent the rays from 300$\mu\mu$ to 400$\mu\mu$. While the external ultraviolet light has a tissue destroying and tissue irritating effect upon the living eye, and is contraindicated for the purpose of fluorescent slitlamp microscopy, the inner ultraviolet provides that wave length scale which we can employ without damage to the patient. When examining with the inner ultraviolet, that is, invisible light, it is necessary for purposes of orientation to utilize a small part of the neighboring visible light. On the other hand this visible portion must not extend so far upward in the wave length scale that the relatively weak fluorescent light is suppressed. It is, therefore, recommended that violet and indigo be included. For this purpose, a 1.5 or 2 mm. thick violet uviol glass is introduced into the illuminating system; and in this way, wave lengths from λ310$\mu\mu$ to approximately 425$\mu\mu$ are utilized. The microscopist works in this way with an indigo violet colored field, and retains in the dark room orientation as to the exact location within the eye; and he can study without difficulty the fluorescent phenomena.

In order to carry out fluorescent microscopy of the living eye, in inner ultraviolet light or in visible indigo violet light, it best serves our purpose to choose for the illuminating system only lenses of quartz. These lenses permit to pass not only the total inner ultraviolet light but also the greater part of the outer ultraviolet light. As the latter is unsuitable for the slitlamp, because of its irritating and injurious effect on the ocular tissue, it is necessary to exclude this outer ultraviolet light. This exclusion is achieved by using nitra light with hypervoltage, as the globe of the lamp itself absorbs all light below 360$\mu\mu$. If one prefers arc light, the uviol glass plate affords the required protection. When using the arc lamp it is also necessary to provide, as a heat filter, a chamber of quartz glass containing water.

If it is desired to avoid the construction of quartz lenses for the slitlamp, it is possible to render fluorescent phenomena visible, by using the usual lenses ordinarily provided in connection with the arc light. To bring this about, a thin indigo violet filter is introduced into the illuminating rays, and then the work is carried on with wave lengths that extend from 350$\mu\mu$ to 425$\mu\mu$. However, the intensity of the fluorescent light is decidedly less than when the apparatus with quartz lenses is available. Nevertheless, in this way many phenomena can be adequately studied, especially when the observer is sufficiently dark adapted. For slitlamp illumination of the living eye with ultraviolet light, it is important that the absorption power of the normal cornea begins to increase with wave lengths of 360$\mu\mu$ and under. At the wave length of 300$\mu\mu$, the cornea absorbs all light in direct illumination. The living lens has an absorbing power higher in the scale and absorbs a certain part of the indigo violet light which falls upon it or penetrates it.

This capacity for light absorption on the part of the lens grows as we proceed to the increasingly shorter wave lengths of the inner ultraviolet. However, the normal lens possesses, according to Hallauer, between 330$\mu\mu$ and 310$\mu\mu$, a rather constant band which is intensively pervious. Therefore, only those ultraviolet rays that

lie near to the border of the visible 400, or which lie in the zone of Hallauer[5] penetrate to the deepest parts of the living eye. The more light there is absorbed by a tissue, the less in general will be reflected. When we illuminate the ocular tissues with an optical system of quartz glass with a wave length between 475$\mu\mu$ and 300$\mu\mu$, we receive a correspondingly small part of the light from the cornea, lens, or vitreous. If fluorescent bodies are located in the structures, they light up with fluorescent colors in proportion to their absorbing capacity, and this characteristic indicates their presence to the slitlamp microscopist. If arc light and a quartz optic system are used, the fluorescence may be relatively intense.

In connection with the technic of fluorescent microscopy of the living eye with the slitlamp, it may be observed that the normal living tissue of the cornea and iris does not fluoresce, and therefore appears dark indigo violet in ultraviolet light of the slitlamp; and it displays no areas which light up as red, green, or yellow. If particles are seen illumined with such colors, they are recognized as fluorescent and, therefore, pathologic. Everyone is familiar with the green or red color of corneal or conjunctival scars after fluorescein has been instilled, for this agent effects a better recognition of their finer form, position, and extent.

In this connection the investigations of Thiel[6] are interesting. He utilized an ordinary arc lamp enclosed in an opaque housing with an appropriate opening. In the rays from the arc light he introduced an ultraviolet filter and utilized a quartz lens to concentrate the light on the eye of the patient Previously this patient had been given two grams of sodium fluorescein by mouth. Thiel then observed (with the ordinary corneal microscope) the fluorescent effect of the sodium fluorescein in the region of the anterior chamber. In this way Thiel was able to establish that no fluorescein was visible in the interior of the anterior part of the clinically normal eye, either coming from the posterior chamber thru the pupil, or upon the iris surface. In eyes that showed inflammatory changes after irritation of the ciliary body and with lower pressure in the anterior chamber, and in herpes corneae, he observed with the above method fluorescein passing out of the posterior chamber and coming around the iris edge into the anterior chamber. On the basis of this observation, physiologic occlusion of the pupil was not probable. On the contrary, on account of the inflammatory changes and irritation, the cilary body had become permeable for the dye.

In clinically demonstrable glaucoma the passage of the fluorescein thru the pupil from the posterior chamber occurred without the iris taking part in the process. If glaucoma exists clinically in one eye, the above mentioned fluorescent phenomenon can be perceived in the fellow eye which showed no clinical evidence of glaucoma. This explains the observation that glaucoma is usually bilateral. The findings of Thiel indicate that some significance is attached to the function of the ciliary body in the genesis of glaucoma, and this is either in the sense of an abnormal secretion or an abnormal permeability. At any rate the method offers a way, when glaucoma is suspected, to establish the diagnosis with probable certainty. The observations of Thiel by means of the experiments mentioned are worthy of being thoroly tested out. In positive cases we would therewith obtain an extraordinarily valuable method for the early diagnosis of glaucoma. Besides, by means of fluorescent microscopy of the living eye with the Gullstrand slitlamp, we could arrive at important conclusions about the correctness of Hamburg's theory of physiologic pupillary occlusion, or the opposed theory of Leber.

When we observe corneal or conjunctival scars after the instillation of fluorescein in ultraviolet slitlamp illumination, we recognize many details in such scars that would escape our attention with the usual slitlamp method. One observes in this way the form, location, and extent of the cicatrices with the greatest precision; and one is able to render visible the situation and direction of the fibrous bands which

compose the scar; and above all, it is possible to clearly reveal any fluorescent crystalline deposits in such cicatrices, especially cholesterin. The latter is usually seen as fine greenish, sometimes reddish, iridescent, mostly rhomboid shaped particles. It is encountered after hemorrhages in the cornea, the anterior chamber, in corneal scars, upon the iris, especially after hemorrhage, and in tuberculous processes. These fine greenish or reddish glistening, mostly rhomboid crystals can be seen in all such conditions even with the usual slitlamp methods. The use of the ultraviolet light renders them more strikingly visible, due to the fluorescence to which they give rise.

The living lens, contrary to the nonfluorescing normal anterior segments of the eye, displays a rather intense fluorescence in illumination with violet or ultraviolet light. This is well known and has been described by many authors. I mention here only Hess, Birch-Hirschfeld, and Vogt. The physiologic fluorescence of the normal lens is especially clearly visible with the ultraviolet light microscopy. The whole lens is illumined a gray blue, especially marked where the bandlike light of the slitlamp traverses it. However, there occurs a more or less complete obscurity of the tissue details on account of the fluorescence of the whole lens substance, so that such details can be less well defined than with the usual slitlamp method.

Sometimes under physiologic conditions, more commonly in senile changes and constantly in complicated cataract, traumatic, and electric cataracts, also in hypermature cataract and in many secondary cataracts, cholesterin crystals can be seen in the lens even in the ordinary illumination of the slitlamp, but are especially obvious in violet ultraviolet fluorescent light. In investigation of the lens with ultraviolet light, the fluorescence of the lens as a whole is somewhat disturbing. It does not attain the degree of the fluorescence of the cholesterin so that the necessary contrast remains effective. Above all, these cholesterin crystals can be discerned, and identified as such, in mature and complicated cataract, as well as in forms of developing or mature electric cataract.

Neither in the normal or pathologically altered living vitreous, including all the forms of synchysis scintillans described to date, were we ever able to observe cholesterin in any form, with either the usual slitlamp or with fluorescent microscopy with the same instrument. This confirms the opinion published by me in 1918 that cholesterin in synchysis scintillans occurs only in enucleated or artificially hardened and in embedded eyes, and not in the living vitreous "in situ." Cholesterin in the vitreous in such cases must be regarded as a postmortem product. As I indicated at that time, the whitish gray, or more or less fat like, glistening particles seen in various forms of synchysis scintillans with the slitlamp, consist in all probability of palmitin, stearin, and margarin. In this category belong those well-known soap like bodies discovered by Verhoeff. All these bodies appear amorphous with the slitlamp and not crystalline from which alone the absence of cholesterin can be adduced. The glittering snow storm effect, occasionally seen with the ophthalmoscope in synchysis scintillans, does not in any way indicate the presence of cholesterin.

The conclusion will not appear strange when we consider that the vitreous with its ultrafine fibrillation represents the most delicate structure and most transparent tissue which we possess in the living body. The removal from the eye and the technical treatment with hardening fluid and other chemicals must so alter the structure and chemistry of the preeminently fine vitreous fibrillation, that the impression gained from the dead and hardened vitreous must not be identified without further consideration with the condition in the living eye. This alone explains the difference between the findings with the slitlamp and the results of microscopic anatomy. In contrast to the negative cholesterin findings in the living vitreous, we ob-

serve occasionally in the erect image of the ophthalmoscope (that is, an erect ophthalmoscopic image with the magnification of 15 or 16, but especially with the usual slitlamp or with violet ultraviolet fluorescent light, in microscopy of the retina by means of my contact glass) greenish, glistening cholesterin crystals which are located in the limitans interna of the retina and which can be easily recognized. These greenish, glistening, actively fluorescent cholesterin crystals are seen especially after hemorrhages in the fundus, in detachment of the retina, in traumatic hole formation in the macula, in recurring hemorrhages in the fundus and vitreous, hemorrhages in consequence of tuberculous periphlebitis of the retinal veins (Fleischer, Harms, Meissner, author[3]). Similarly we observe these crystals quite frequently during the development and after the subsidence of a typical choked disc; but these crystals are consistently missing in the actual inflammation of the optic nerve. On account of these observations one is almost inclined to utilize the presence of cholesterin upon or near the optic nerve as a differential diagnostic criterion in doubtful cases of subsiding or terminated choked disc, or of optic neuritis.

At the conclusion of this chapter let it be added that it is a fatal error to regard every greenish or reddish, glistening or glowing particle or point in the ocular media, especially in the lens, as an indication of cholesterin. As I have shown in my text book "Polarization Microscopy of the Living Eye with the Slitlamp"[4], very fine particles of whatever composition and of ultramicroscopic size can light up with similar colors, when the diameter of the particle is such that it corresponds with the wave length requisite for absorbtion. We are mostly concerned then, in the case of such greenish and reddish glowing points, with fine tissue particles, or cataract or chalk particles, but not with cholesterin. The latter has a crystalline rhomboid conformation which indicates the differentiation.

5. SPECTROSCOPY OF THE LIVING EYE WITH THE SLITLAMP.

In the second volume of my treatise, entitled "Die Mikroskopie des lebenden Auges" (Berlin: Julius Springer, 1922[5]) I have described a new method by which we are in position to draw conclusions with the slitlamp about the histochemical condition of the observed ocular media. This method consists in the spectroanalytic observation of the living eye with the slitlamp.

To carry out this investigation, the light proceeding from the slit and reflected from the individual ocular tissue elements, is observed thru an Abbé spectroscopic ocular, which is introduced into one ocular tube of the microscope, while the other ocular serves for observation. As light source, arc light is most suitable. In this way, one observes on the living conjunctiva, especially in an irritated condition, a definite oxyhemoglobin spectrum. The absorption bands appearing in yellow and green are clearly evident in hemorrhages, then mostly accompanied by a darkening of the right spectral area which is to be attributed to the presence of hematoidin. The hematoidin spectrum can be seen in a jaundiced conjunctiva even after the disappearance of the general icterus. A methemoglobin spectrum was never demonstrated in the living conjunctiva. After the instillation of fluorescein and subsequent flushing of the conjunctival sac with water, for the purpose of removing the excess of dye, I found a slight indication of the fluorescein spectrum.

One does not observe any characteristic spectrum changes in the normal or clouded cornea, also not in the aqueous or the vitreous. Blood in the anterior chamber is indicated by the presence of oxyhemoglobin bands. The spectroscopy of the iris and chamber angle has to reckon with the individual color of the illuminated tissues, but it affords nothing of interest. The lens displays a darkening in the red, and a definite shadow in the short wave portion of the spectrum. These shadings diminish with denser opacities. The spectrum of the fundus shows itself to be decidedly influenced by absorption

of the light in the lens and by the pigment content of the fundus. The oxyhemoglobin bands are frequently clearly seen. On the papilla the spectrum is lighter and, especially in the short wave portion, it is clearer than in the rest of the fundus. In inflammation one sees also in the papilla spectrum and well defined hemoglobin bands. Atrophic retinal and choroidal areas afford a spectrum similar to that of the conjunctiva near the limbus. Fisher[9] of Leipzig has confirmed and elaborated with further observations all these findings which were published by me in 1923. I refer for further information to the article by this author.

III. POSSIBILITIES AND PROSPECT FOR INVESTIGATION OF THE LIVING OCULAR MICROCOSM.

In following the paths which we have pursued so far, there open before us certain promising prospectives for the further investigations of the living intraocular microcosm, the nature of which we must (in conclusion) briefly touch upon. These prospectives depend upon the following possibilities:

1. The spectroscopy of the living eye in polarized light of the slitlamp.

2. The ascertaining of the intraocular pressure by purely optical means, without mechanically touching the eye with any instrument to estimate ocular pressure, thus avoiding annoyance to the patient and injury to the corneal epithelium.

3. The Roentgen optic microscopy of the living ocular tissue, as a means of investigating the intraocular crystallin lattice structures and their influence upon the genuine double refraction of the transparent ocular media, especially the living cornea.

These three possibilities are not the only ones in as much as the combination of all of them, as well as the previously described methods, appear capable of realization. Disregarding such possibilities the following may be said of the first mentioned method.

1. *Spectroscopy of the living eye in polarized light.* If we utilize for spectroscopy of the living eye light polarized by inserting a Nicol polarizer in the system of illumination, while the observation is carried on by an analysing Nicol which is suitably combined with the spectroocular, we can study certain other phenomena, especially when the arc light is employed for illumination.

In this category belong the phenomena which are observed when we spectroscopically analyze light which has passed thru doubly refracting plates or membranes, which are disposed with axes parallel. One sees under these conditions dark bands in the spectrum, which correspond to the color extinguished by interference. These bands become more numerous with the increasing thickness of the plate or doubly refracting membranes. Regarded from this standpoint, the intraocular double refracting membranes, Bowman's, Descemet's, anterior and posterior lens capsule, are optically too thick to show visible bands, for the reason that the bands in the spectrum are so decidedly numerous and delicate that they cannot be perceived by the observer. Because of this the spectrum of the intraocular membranes appear, even in polarized light, without bands and, in the usual polarization microscopy, pure white. For each color extinguished by a band there remains another of almost equal physiologic value.

2. *Ascertaining intraocular pressure by purely optical means.* Polarization microscopy of the living eye with the slit lamp is of special interest, in as much as the possibility lies close at hand of ascertaining the ocular pressure by purely optical means, without mechanically touching the eye. As the result of polarization microscopic investigation on the living eye, especially of the living cornea, we know that the individual fasciculi composing the lamella are doubly refracting, whereby the optical axis then corresponds to the fiber length. On the contrary the cement lines situated between the individual fibers are optically singly, or doubly refractive with radial axes. In any case the double refraction of the fibers themselves depend on two factors.

The first factor is the socalled genuine double refraction, a natural state,

manifestly determined by the intraocular crystallin lattice like structure of the living corneal fibers. To this there is added a second factor, namely, the double refraction caused by the stresses arising from the intravital tension derived from the fixation of the cornea in the scleral ring. This tension causes a double refraction which we designate in optics as accidental. While we can regard the genuine double refraction as determined by nature and as nearly constant, the accidental double refraction of the membrane is a function of the prevailing tissue tension. The double refraction rises and falls with the increase or decrease of the tension of the corneal tissues. This tension is dependent on the intraocular tension and is a function of the latter. If we succeed in measuring optically, that is, numerically, the accidental double refraction of the cornea at a given time, we can arrive empirically by comparison with repeated records made in the usual way, at a scale of values which will designate without touching the eye the ocular tension at a given moment. This intraocular tension recorded at a given moment would represent the double refraction which would be dependent on the corneal tension.

In this way, by omitting the frequently erroneous and variously registering tonometer, a great service will be rendered to the patient. The problem will be approached upon the basis of these considerations, the necessary apparatus and the technic; and the result will be the subject of a future communication.

3. *Roentgen optic microscopy, as a means of investigating intraocular crystallin lattice structures and their influence upon genuine double refraction.* As a last resource, to extend the exploration of the intraocular microcosm intravitan to utmost limits, I mention the use of the Roentgen rays. These rays, as we know today, are to be regarded as very short light waves whose wave length lies between 0.03$\mu\mu$ and 0.15$\mu\mu$. This wave length is extremely minute and varies from a tenth to a hundredth of a millionth of a millimeter. In comparison, the shortest light waves of visible light have a length of 400$\mu\mu$. They are therefore, 3,000 to 13,000 times as long as the Roentgen rays in use. The wave like nature of the Roentgen rays is established by the refraction phenomenon which is observed in connection with them. Only we must employ with the Roentgen rays, on account of their enormously shorter length, a much finer screen than with visible and ultraviolet light.

Suitable screens to deflect the Roentgen rays are presented by the crystals. In the crystals, as is now established, molecules are regularly disposed. This affords a lattice or screen like structure. The width of such a lattice opening is therefore the amount of the distance between two molecules, that is, about 4/5$\mu\mu$. Von Laue[10] has shown that if a small bundle of Roentgen rays are passed thru a diaphragm of zinc, placed on top of a photographic plate, deflection figures are regularly displayed. One can observe in the center of such figures the place of direct penetration of the Roentgen rays as a sharply defined black spot. Around this spot other similar spots are seen to be regularly disposed, and correspond to the rays deflected by the regularly disposed molecules of the crystal. These spots display precisely the symmetry possessed by the crystal, in the direction vertical to the direction of the Roentgen rays. Similar symmetric crystallin structure pictures can be obtained by examination of crystallin bodies, such as rock salt or table salt. The great instructress Mother Nature provides, in the deflection phenomenon observed with the Roentgen rays in crystallin structures, a clear indication of the way in which we may penetrate to an understanding of molecular structures of the living ocular tissues, especially the cornea and the lens.

Appropriate investigations were therefore undertaken to elucidate the question as to whether the above mentioned ocular media possessed a crystallin structure or not. Ebner and others have shown[4] that the dead

cornea which has been removed from the eye possesses a double refraction, which is designated as genuine and which is an indication of its crystallin lattice structure. Without such crystalline structure no genuine double refraction could be present in such a cornea. This also applies to the lens. Suitable investigation to decide these questions is indispensable. In addition it does not seem out of the question to obtain certain differences in the resulting Roentgen diffraction picture in various corneas and under varying general conditions. In this way one may arrive at certain differential diagnostic criteria, which are typical of many local and general pathologic states. If these observations are crowned with success, a new and grateful prospective would be revealed, and the microscopy of the living eye for the investigation of the intraocular molecular structures would be further advanced.

Whether it will be possible to take advantage of the property of the reflection of the Roentgen rays in the crystalline lattices and individual layers of the living ocular media and to fix photographically, and by comparison in a differential diagnostic sense, to properly evaluate the various interference pictures of the reflected wave surface obtained under healthy and diseased conditions, the future alone must disclose.

In concluding this discussion of a greater extension of the use of the slitlamp, may the science of ophthalmology, after successful experiments at a not too distant date, enjoy to the utmost the fruits of these new and extremely promising methods of examination.

I wish to embrace this opportunity of expressing my thanks to Dr. Clarence King of Cincinnati for his invaluable assistance in preparing this article for publication in English.

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SOME ESSENTIALS OF GLIOMA OF THE RETINA WITH A CASE REPORT.

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An eyeball removed before there was extraocular extension or metatasis contained a growth presenting the different characteristics of socalled glioma of the retina. The whitish reflex from one pupil was noticed when three and one-half months old.

In the study of malignant intraocular tumors, one must consider himself fortunate when he obtains a specimen that has attained the exact stage which shows all of the essential characteristics belonging to a particular type. In the present case it was possible to study the essential details of glioma of the retina in a single low power field. There was no evidence of extraocular extension or metastasis.

The enucleated globe was sent me by Dr. E. E. Holland of Richmond, Indiana, who supplied the following history: "D. M. C., age four months, weight fifteen pounds, well nourished. The ascertainable family and past personal history was negative. When

the child was three and a half months old the parents noticed a peculiar appearance in the right pupil. The general examination was negative; no pathology was found except in the right eye, which was blind.

The eyeballs were of equal prominence, and their movements in the orbits were normal. There was no congestion in either eye. The tension was the same in both eyes. The irides were clear and of the same color and pattern, and both lenses were transparent. The media and fundus of the left eye were clear and normal. The pupils were unequal; the right was larger, sluggish in reacting to light, and of limited movement. The left pupil was normal in size and reaction. The right pupil showed a whitish reflex, while the left had the usual red reflex. Focal illumination of the right pupil showed, behind the lens, a yellowish rounded mass, upon the anterior surface of which were seen three blood vessels and their branches. The mass seemed to occupy most of the vitreous chamber; it was motionless and had a solid appearance.

The eye was enucleated promptly. The patient left the hospital on the fourth day, and made an uneventful postoperative recovery. Frequent observations have been made over a period of nine months following the operation, and no evidence of recurrence, or of other manifestations of ill health have been noted.

The specimen, received in formalin solution, measured 20 x 19 x 18 mm., and weighed 3.7 gms. Orientation, right eyeball. There was a bulging of the lower part, and misplacement of the insertions of the muscles; otherwise the surface showed no pathology. The cornea was horizontally oval, 11x10 mm. The anterior chamber was shallow. The pupil was round, 5.5 mm. in diameter. The lens was opaque, as occurs in fixation, and the anterior Y figure was conspicuous. Nothing was visible behind the lens. By transillumination a mass was located in the lower part of the globe.

MACROSCOPIC EXAMINATION.

The globe was divided obliquely in the vertical plane. A quantity of watery fluid escaped. The photograph[1] of the divided globe was made before the specimen was hardened in alcohol. A solid mass in each half of the eye swung free from detached retina. The sclera showed no changes except a slight thinning below. The cornea was thickened. In the right half the lens protrudes into the pupil, due to an accident in manipulation; the true position of the lens is seen in the left half. The cut surfaces of the cornea show certain white spots which were not found in the sections; these were likely lime particles washed from the tumor (where they are seen also).

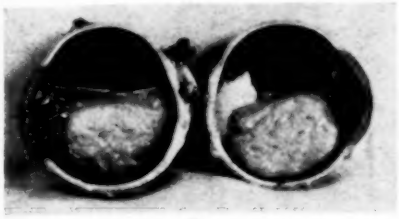
The iris was crowded forward. The ciliary body was small, but regular in the pars plicata, and normal in the pars plana where the meridional striations were easily seen. No defects were found in the choroid, except a bleached area in the lower posterior part. The retina was attached only at the papilla and the ora serrata, and was the whole support of the tumor. The stump of the optic nerve was enlarged.

The tumor measured 12 mm. anteroposteriorly, and 8.5 mm. in diameter. It was of a grayish yellow color, and both the natural and cut surfaces appeared to be cheesy or granular. The natural surface suggested a capsule, which was not identified microscopically.

Differentiation when the retina is detached: A tumor of the retina is merged with the detached retina, while the latter merely overlies any growth arising from the choroid. The exudate from metastatic choroiditis fills the vitreous chamber; when fixed in formalin it becomes translucent and takes on a delicate green color; the mass of the exudate shrinks in alcohol hardening. Subretinal fluid does not form a tumor. Embryonal connective tissue in the vitreous does not so completely detach the retina if at all, and would lie inside the retinal sac, as would a cysticercus.

MICROSCOPIC.

The halves were hardened in alcohol and serial sections, 6 mu. thick, were cut. Examination by low power revealed the nature of the growth, and exhibited the various processes which characterize gliomas of the retina. Tubules, occurring in groups[4], were the



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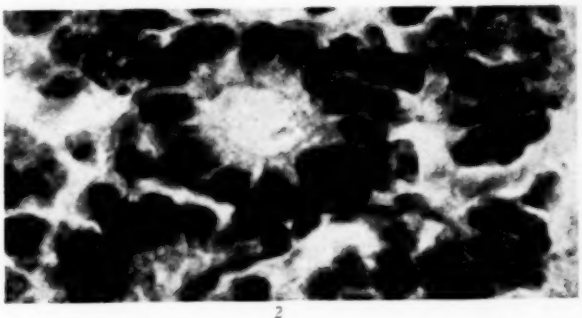

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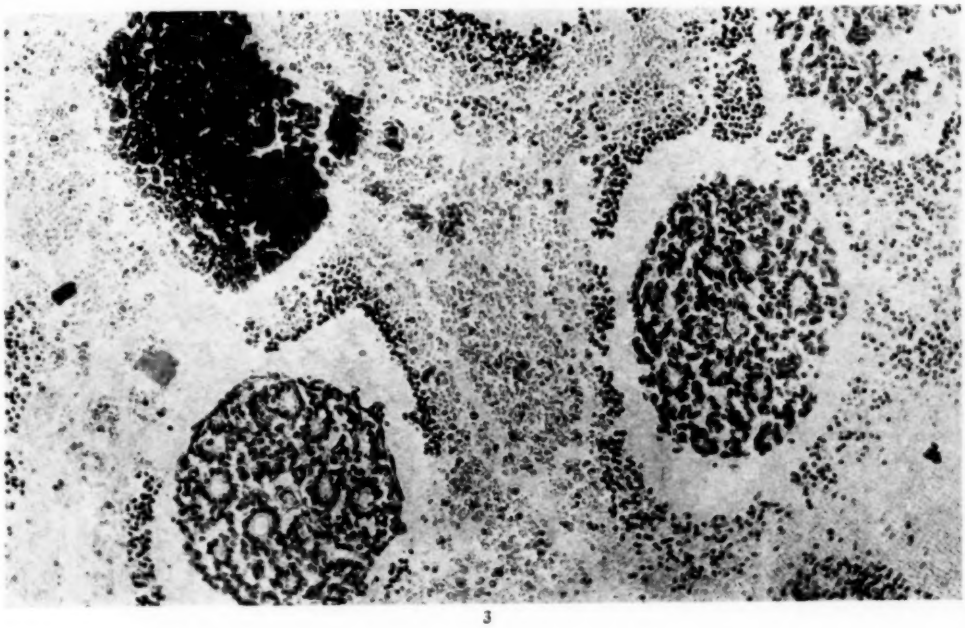

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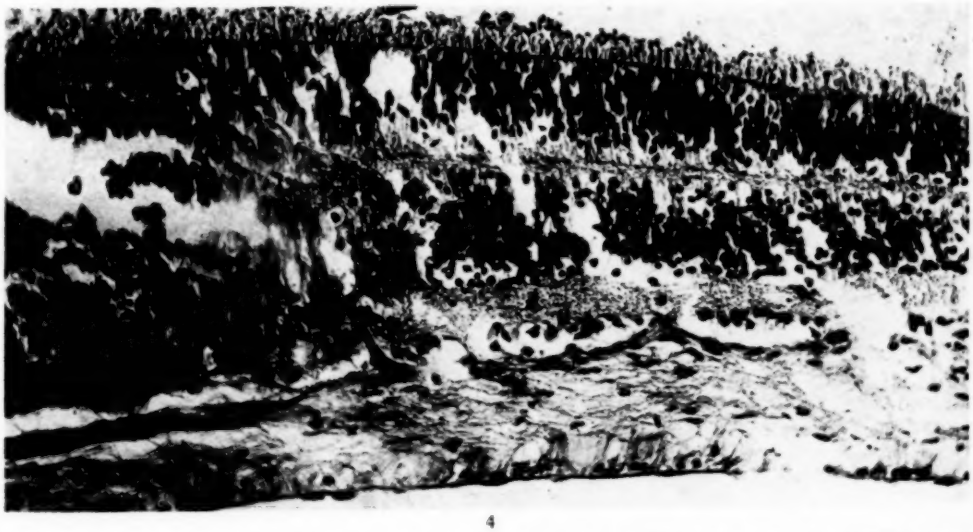

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GLIOMA OF THE RETINA (RUTHERFORD). 1. TUMOR IN DIVIDED EYEBALL. 2. TYPICAL ROSETTE UNDER HIGH POWER. 3. GENERAL STRUCTURE OF TUMOR UNDER LOW POWER. 4. RELATION OF TUMOR TO LAYERS OF RETINA.

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dominant figures demonstrated. Each tubule constituted a blood channel without endothelium. Surrounding the blood column the tumor cells proliferate abundantly, forming a cell mantle around the tubule. The rapid proliferative process crowds the older cells from the blood stream, until they are no longer sufficiently nourished.

There is first a loss of the scanty intercellular substance, so that the cells fall apart. Then the cells lose their cytoplasm, and later the nuclei disintegrate. These changes are marked by a gradual loss of staining power. As dissolution progresses, areas of necrosis are formed, and these stain faintly if at all. As necrosis proceeds to liquefaction, calcareous deposits are formed in these areas. If a cross section of a tubule is examined under high power[5], it is found to be formed of spoke like cells containing little cytoplasm, and very large oval or oblong nuclei. The figure is called a rosette, and has not been described in connection with any other tissue except that found in gliomata of the retina, and in the retinas of some undeveloped eyes. The tips of the cells within the lumen unite to form a basement membrane (Verhoeff, R. L. O. H. Reports, Vol. XV, Part iv.)

The tubular character may exist independently of rosettes. A specimen from Prof. E. Fuchs' clinic shows tubules and other glioma characteristics, but no rosettes; and was described (American Lecture Tour Notes, 1922) as having had its origin from the inner nuclear layer of the retina (See also A. Fuchs, Atlas Histopathology of the Eye, 1924, Plate 41, Fig. 2, and Discussion). Knapp (Intraocular Tumors, English Ed., 1869) suggests that the nearer the origin is to the optic nerve, the more abundant are the ("Ears of maize") rosette formations. That observation holds true for this tumor, as its origin was located 1.5 to 2 mm. below the margin of the papilla. This fragment[7] had the appearance as tho the main tumor mass had been torn from it, and a corresponding defect in the outer layer of the tumor was found in another section.

This location suggests a probable origin from the rod and cone layer, and some investigators assert that only those tumors arising from this layer will show rosettes. Parsons (Pathology of the Eye) doubts the influence of the layer of origin on this peculiar figure. Underlying the site of origin the choroid is greatly thickened by edema. Pigment is absent in this area. As the choroid is traced forwards progressively better preserved fragments of choroidal and retinal pigment cells are found, and anteriorly the pigment is in a fairly normal condition. There is no true stroma in the tumor. An occasional trabecular band[7] is seen, probably the cord like remnant of a blood vessel. Some sections show parts of retinal vessels having endothelial linings. It is surprising how abruptly the retina may be invaded by the tumor growth. A section[8] displays the various retinal layers clearly, and almost immediately all detail is lost in a mass of tumor cells.

METASTASIS.

In part, the mode of transmission depends on the loss of intracellular substance and the liberation of individual cells. These tumor cells resemble the cells in the nuclear layers of the retina. If the free cell possesses vitality and is deposited where it can be nourished, it may initiate a new proliferation. Thus, other ocular structures may become involved secondarily, or the cells may migrate to distant organs and tissues of the body. This process accounts for metastatic growths at distances from the parent mass. The lymph stream is the principal carrier, altho the blood stream may not be unimportant. In this specimen small clumps of tumor cells were found lying on the choroid, and on other free surfaces inside the eye.

No sections were cut to show the venae vorticosae or the emissaria, and no statement can be made as to their tumor cell content. No such cells were found in the angle of the anterior chamber or in the canal of Schlemm. The pigment layer of the iris was in part adherent to the anterior lens capsule. This may have resulted from a low grade inflammation, or from pressure. Otherwise the iris looked nor-

mal; so also the ciliary body and Descemet's membrane. While the brain may be invaded by direct extension along the optic nerve, detached cells may be carried there along the spaces of the nerve sheaths. No clumps of tumor cells were found in the nerve, or in its sheaths in this specimen. In the central canal containing the central vessels, many isolated cells were found; these looked like lymphocytes. At times it is difficult to distinguish free tumor cells from lymphocytes.

Penway Building.

THE OPERATIONS FOR GLAUCOMA.

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The better known operations for glaucoma are compared with reference to their relative value in different types of cases. The conclusions reached are based on a survey of the literature regarding the different procedures. Thesis submitted for the degree of M. S. in Ophthalmology at the University of Pennsylvania.

The multiplicity of operations designed for the relief of glaucoma, would indicate either that the ideal operation has not yet been devised, or that in so protean a disease, no one operation is applicable to all cases. In this paper, an attempt is made to compare the merits of the better known operative procedures, and to determine for certain types of cases, which mode of surgical intervention promises the best results.

Iridectomy, as first practiced by von Graefe, has received comparatively little attention in recent literature, probably because it is so well established that comment seems superfluous. No author takes exception to iridectomy, in acute congestive glaucoma, altho other procedures have been suggested. However, it maintains its position as the orthodox treatment. Woodruff recommends using it not only here, but in chronic glaucoma as well, reserving the more modern operations for cases in which iridectomy fails. Parker also mentions iridectomy as the operation of choice, and Abadie concurs in this view. Axenfeld believes that iridectomy and cyclodialysis are less dangerous than the various sclerectomies, and does one or the other, hoping that a more radical maneuvre will be unnecessary. Barkan does an iridectomy in acute glaucoma, as well as in the chronic form, where the field of vision is fairly good, and central vision well preserved. Weeks upholds iridectomy in all early cases, where advanced sclerosis has not yet occurred, and as an alternate operation in glaucoma following cataract extraction. de Schweinitz uses iridectomy in acute cases, in glaucoma due to swelling of the lens, and in iritis following other glaucoma operations. Bourgeois contends as does Elliot, that a filtering scar is the chief factor in reducing tension, no matter what operation is done.

The trephine operation of Elliot has inspired more discussion than any of the others, and it is used practically to the exclusion of all others by some men, especially in the British empire. Gifford feels that the results from trephining and iridotasis are about the same, altho the former may be safer. Barkan employs a trephine in glaucoma simplex, and in chronic glaucoma with markedly reduced fields. Odoneal reports a case in which a trephine was done on one eye, and an iridotasis on the other. The latter remained quiet, while the tension of the trephined eye rose, after an initial fall. MacCallan reported a series of 911 trephines with one late infection. He used a 2 mm. trephine, excising only one-half of the disc. Clegg reported one series of 250 cases, operated by the same technic. There was one case of iridocyclitis, following loss of the disc in the anterior chamber and one of panophthalmitis. The results were satisfactory in 80% of the cases, against 62% or less with iridectomy. He does an iridectomy only in old patients, with acute or subacute glaucoma. In another series of 259 trephined eyes, the results were as follows: Acute glaucoma; improved 70%, stationary 25% and worse 5%. In the subacute cases the figures were 47, 42 and 11%, while in simple glaucoma they were poorest, 32, 48 and

20%, improved, stationary and worse. Fox, after trying out many methods, believes that the trephine is the best operation. He first makes a Van Lint flap, dissecting from the limbus upward, and after finishing the trephine and iridectomy, pulls the flap over the opening by two sutures. He prefers the von Hippel mechanical trephine. The same procedure is used by Rowe and Tiffany. Holt, using this technic, recorded one late infection in 29 cases. Schoute preferred trephining to any other method in patients with markedly contracted fields. Wilmer mentions a case in which trephining was successful after two Lagrange operations failed. Nine others, not relieved by Lagrange operations or iridectomies, were permanently improved by trephining. In none of these was the field of vision reduced, and in some an increase was noted. de Schweinitz reported good results in chronic glaucoma, or after other operations failed. In one of his cases of absolute glaucoma, with only a peripheral light perception, the patient recovered central vision of 6/9 after an Elliot operation. Woodruff objects to trephining on the grounds of late infection, iritis and hypotony. He uses it only where iridectomy fails to hold, or in old patients with simple glaucoma. Parker believes that it is valuable where iridectomy fails, or is contraindicated. In 45 cases, he had one late infection and three hemorrhages, but in this series he included patients who had absolute glaucoma and buphthalmus. Meller holds that trephining is less hazardous than a Lagrange operation, but reports 2.4% of bad results in a series of 178 cases. Weeks prefers trephining in buphthalmus, and emphasizes the necessity of daily antiseptic washes, after any cystoid operation. Gifford collected 12 late infections following this operation. Hassler reported the microscopic findings in an eye enucleated after an unsuccessful trephine. The opening was closed by fibrous tissue, and the iris was adherent to the lens, closing off completely, the anterior chamber. Stirling believes the conjunctival suture is a source of infection, while Moore advocates the use of a "water tight suture" for this purpose. This consists of a closely spaced continuous silk suture, extending slightly beyond each end of the conjunctival incision. Moore claims for this method, a larger and flatter filtering area, with no interference from the upper lid, and a decrease in the risk of late infection. He also feels that the anterior chamber is more rapidly restored. In the two cases where the essayist tried this method, all of these contentions were upheld, there being instead of the usual bleb, a cushion shaped edematous area, of about 1 sq. cm. Holth states that late infection occurs in 7% of trephined eyes, which is a wide variation from MacCallan's 1/9%. That late infection is not necessarily fatal to the eye, is shown by reports of Feingold, and Crouch and Clapp. Three cases were placed on record, in none of which the eye was lost, while two regained good vision. Lundsgaard, Cheney, de Schweinitz and Wilmer had no late infections, after a considerable experience with trephining. Furthermore, four of Wilmer's patients had acute conjunctivitis, during a local epidemic.

The operation of iridotasis has many enthusiastic supporters. Goldenburg has used it exclusively for the past five years, in all except secondary glaucomas. C. D. Darling (personal communication) states that in his experience, it has given a higher percentage of good results, than any other glaucoma operation. Gifford had one primary infection in 62 cases. Because of late infection, Barkan cautions against any operation that will produce a filtering scar, where the patient has only one eye. Harrower reported two series of iridotases one of 33 and one of 23 patients, with uniformly good results. Allport had 33 cases, all satisfactory. Stieren reported 6 successful operations, some patients showing an enlargement of the field. Roy reported one case of late infection, five years after operation. Verhoeff described an eye enucleated after an unsuccessful iridotasis. The margin of the iris was adherent in the wound, and there was a layer of connective tissue, attached to the sclera, covering over the prolapsed iris.

Cyclodialysis was discussed by Cords, who called it the best operation for simple glaucoma. In 279 collected cases, the results were: 96 satisfactory in six months, 116 seemed good results but were lost sight of, 66 showed a temporary improvement and 11 were bad results. The operation is regarded as easy, free from danger, with few complications, and usually beneficial. It may be repeated, or any other operation may be done later. Gradle discussed the subject quite fully. He believes its effect is produced by freeing the filtration angle, and that 1/3 of the ciliary circumference should be separated. Its use is limited to chronic noncongestive glaucoma, and it is contraindicated in the acute congestive variety, or in any situation where an immediate effect is necessary. The results, judged by fields, tension and central vision, in a large group of selected cases, were as follows: 50% successful, 20% temporarily improved, and permanently benefited by other operations later, 30% failures. Gradle prefers to try it first in simple glaucoma, reserving the more dangerous trephine, for cases in which cyclodialysis fails. Beselin gives the following results in 40 cases: 75% satisfactory, 12.5% temporarily improved, 12.5% failures. de Schweinitz reported three cyclodialyses, in patients suffering from intractable chronic conjunctivitis. Any other operation would have involved considerable risk of infection, but all these patients had excellent results. In discussing Gifford's paper, Zentmayer upheld cyclodialysis in glaucoma due to disease of the retinal vessels, because the tension may be reduced very gradually, thus lessening the risk of intraocular hemorrhage. Yoshida put on record three cyclodialyses, all of which were followed by acute congestive glaucoma.

Among the less discussed operations, several deserve mention. Iridencleisis, in the hands of Holth, who first described it, gave very good results, but better known, and less difficult maneuvres are equally successful. Butler abandoned the operation because of the large number of late infections. Curran's peripheral iridotomy, after very encouraging early reports by Curran and Gifford, seems to have lost favor, since the results were not permanent, as shown by papers of Black and Gifford. Elschnig reported 16 cases, and believed that tension was reduced in compensated glaucoma. He found the technic far from easy. The Lagrange operation is warmly supported by Ellett. Weeks prefers it to trephining in private patients, where the proper after treatment is assured. He lists 259 cases, with no late infection, return of tension in 4, and iritis in 1. Lagrange and Baron reported 49 patients followed for ten years. 82.5% had good vision, 5% showed hypotony, while 80% had normal tension. There were no late infections. Deutschmann placed on record 47 Lagrange operations, with only 11 good results. Verhoeff described a new operation of cyclectomy, which was successful in nine cases.

The use of adrenalin as reintroduced by Hamburger, and advocated by Gradle, is a very helpful procedure. He injects up to 6 min. subconjunctivally, which causes the pupil to dilate ad maximum, with a very marked reduction in tension. In some cases the tension remains low for hours or days. It may not be used in simple glaucoma. Of late (personal communication) he has been placing a small pledget of cotton, moistened with 4-8 min. of adrenalin, in the upper fornix. This is allowed to remain from 3 to 5 minutes, and produces the same effect. This procedure has replaced posterior sclerotomy in his practice, and it is of distinct aid in any glaucoma operation where it can be used.

It is obviously impossible to give absolutely definite conclusions, and the following merely represent the trend of the majority of oculists quoted.

SUMMARY.

1. No one operation can be used in all cases.

2. Iridectomy is the operation of choice in acute glaucoma, together with preliminary posterior sclerotomy, or adrenalin, if needed. Trephining or iridotasis is permissible.

3. The Elliot trephine should be used in chronic noncongestive glaucoma, especially with contracted fields. Iridotasis may be done. Cyclodialysis

may be tried first, reserving the trephine for resistant cases.

4. Iridectomy should be performed, in glaucoma due to swelling of the lens.

5. Buphthalmus is best combatted by trephining, or repeated posterior sclerotomies.

6. Cyclodialysis should be used in glaucoma due to disease of the retinal vessels, and it may be done in patients who have chronic conjunctivitis.

7. Adrenalin is valuable in ophthalmoscopic examination, as a therapeutic agent, and as an aid to operation.

617 *Electric Bldg.*

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FIELD AND FUNDUS CHANGES IN ENDOCRIN DYSFUNCTION.

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Patients referred to the Evans Memorial for diagnostic study undergo a series of vital function tests and very complete clinical observation. Ophthalmoscopic examination and tests of the field were made on patients suffering from marked endocrin dysfunction. The results obtained have been summarized in brief tables and the impairments of the field are illustrated by charts. Read before the American Academy of Ophthalmology and Oto-Laryngology, Oct., 1925.

In an impartial routine ophthalmologic examination of a considerable series of cases, investigated for the possible presence of diseases of the ductless glands, it was noted that enlargement of the blind spots and yellow color of the nerveheads were frequently found, while, with less frequency, contraction or alteration of the form and color fields was observed.

The present preliminary paper embodies an analysis of the eye findings in two hundred eighty cases where an endocrin diagnosis was established with certainty.

The cases here reported are drawn from a much larger number referred to the Evans Memorial for diagnostic study. Preliminary reports of the methods employed and the results attained have already appeared in the literature from Rowe[1-12] and his associates, and an extended report based upon the study of a series of one thousand cases is now in preparation. Briefly it may be stated, that a long series of socalled vital function tests have been standardized by application to groups of demonstrably normal men and women. These tests, supplemented by very complete clinical observations, were next applied to individuals of established endocrin etiology, such as surgical castrates, hypothyroid and pituitary subjects, and advanced cases of exophthalmic goiter and acromegaly. The direction and amount of deviation from the normal induced by the several conditions in the complete series of observations gave the basis for the differential diagnosis of the individual endocrin entities. The third group, from which this series is drawn, comprised in the main cases of an obscure etiology which presented various clinical evidences of a possible endocrin involvement. The clinical study and laboratory observations were sufficiently comprehensive to evaluate existant nonendocrin pathology, and only in the proven absence of any such conditions were observations interpreted in terms of endocrin disorder. The elimination of all cases but those not

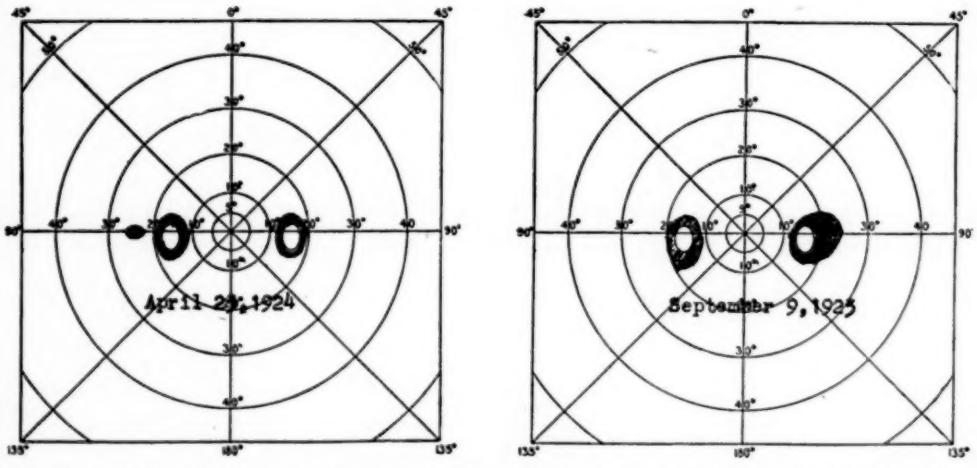

Fig. 1. Case No. B-71, Miss E., aged 49, Pituitary dysfunction. Ant. Lobe underaction; Post. Lobe overaction. Obesity. Neuropathic keratitis right. Yellow discs. Increased density of hypophysis and erosion of posterior clinoids. Treated. Reduction of blind spots in seven and one-half months.

explained by a known cause other than the endocrin disturbance should be emphasized.

The value and significance of ophthalmologic examinations was recognized from the beginning, but for a variety of reasons could not be applied in all cases of the first series. The present group of two hundred eighty cases are drawn from the first five hundred in whom an endocrin diagnosis was established. Subsequently, as conditions have permitted, the eye examination has been made an integral part of the routine examination of every case. The earlier examinations brought out some highly interesting facts. It was early noted that many cases exhibiting enlarged blind spots and yellow discs, proved in the ultimate analysis to be classified as some one of the several forms of pituitary aberrations. Field changes and other disc changes have been frequently encountered as well as vascular and pigmentary alterations.

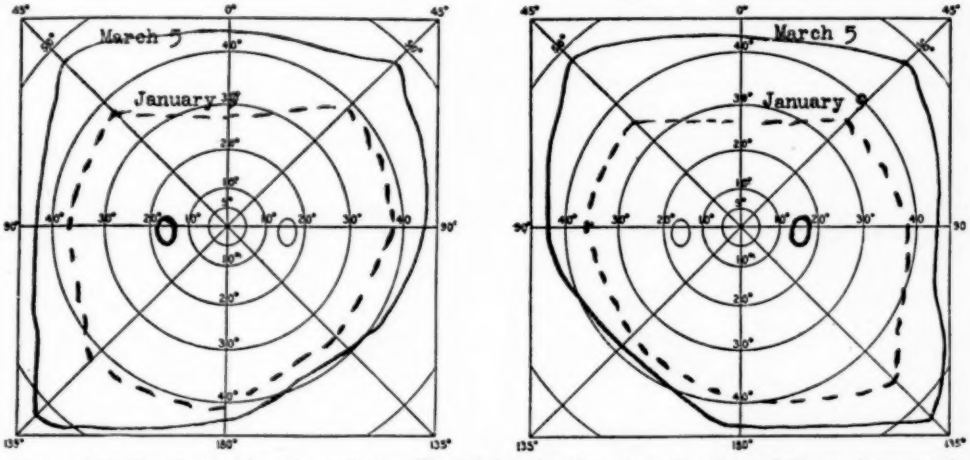

Fig. 2. Case No. B-110, Mrs. S., aged 53. Thyroid hypofunction, treated. Form fields at three months interval.

An important fact to carry in mind is, that these cases have been examined impartially, no previous knowledge of the patient having been obtained; therefore, the findings are purely physical findings per se. Subsequently, certain history and subjective symptoms were ascertained to aid in interpreting questionable points.

The cases were studied under two

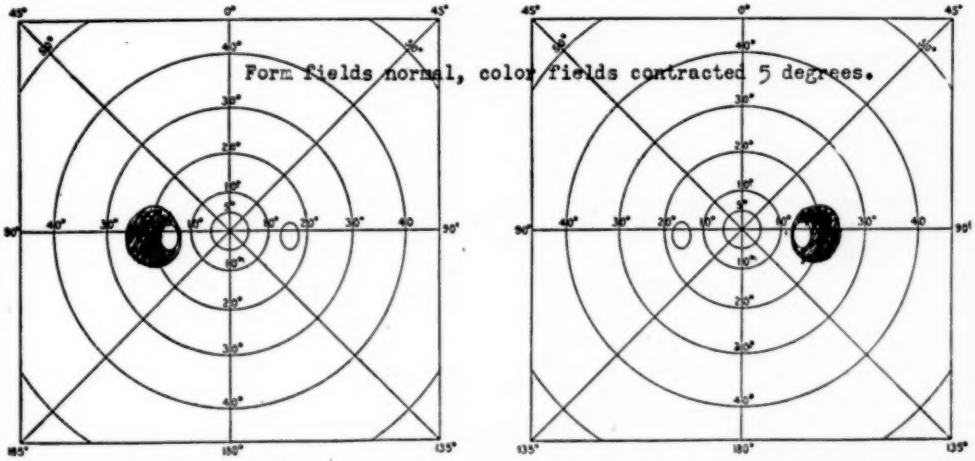

Fig. 3. Case No. B-113. Miss O., aged 10. Pituitary dysfunction. Post. lobe underaction. Marked obesity, weighs 195 pounds. Sella 8 mm. x 3 mm.

groups: the B series, which entails a study for a period of one week, from which one hundred fifty-five of the cases here presented are drawn, and the S. Series, composed of cases receiving an abridged form requiring but half of one day, furnishes the remaining one hundred and twenty-five. The routine ophthalmologic examination applied to these cases included the visual acuity, the size, shape and reactions of the pupils; extraocular position and motions; a study of the media and fundi; and field study including form, colors, blind spots, and maculae.

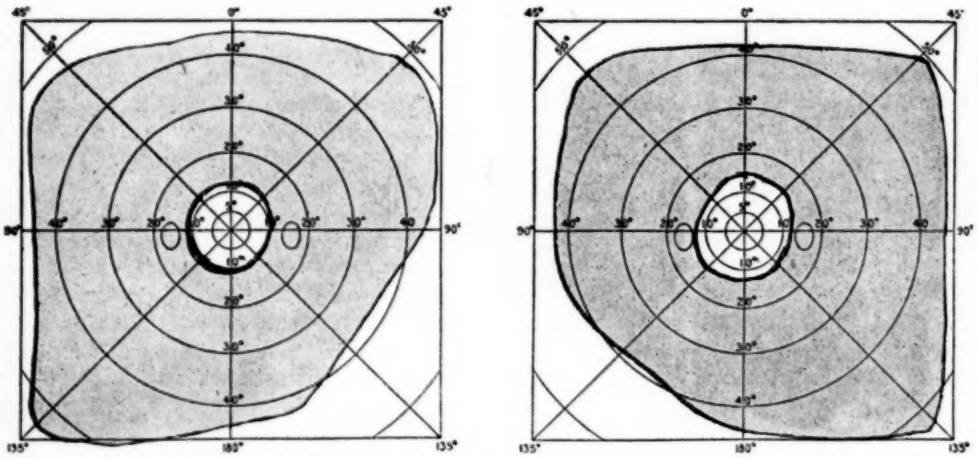

Fig. 4. Case No. B-212. Master O, aged 15. Pituitary dysfunction. Ant. lobe underaction. Post. lobe overaction. Height 5 ft. 8 in. Large abdomen (ascites). Skull 9 mm. thick. Sella small.

TECHNIC.

Peter's hand campimeter was used for blind spot, form and color field determination. Using Peter's blind spot delineation, any measurement in excess of a circumferential two degree, or a quarter, half, or three-quarter, three or four degrees enlargement are classified as "enlarged blind spots." All enlarged blind spots thus obtained were further checked on a small Lloyd slate, with a wide angled stereoscope. Macular acuity studies were made with the latter instrument, using a 1.5 mm. object at 16.5 cm. for white, blue, red, green. The test object was carried from blind to seeing and signalled usually by voice. A 5 mm. or 6 mm. object was used for form and color fields, and a 3 mm. object for the blind spot determination. With the hand campimeter of Peter, the latter sized object subtends an angle of two degrees. Glasses were not used except in rare instances of high refractive error. The hand campimeter was used because a portion of the patients were seen at the bedside, several in fact in bed, and not infrequently partly reclining or prone, while the majority were studied in better office circumstances; a uniform laboratory technic was thus rendered impossible. Attempts were always made to obtain uniform lighting, so far as possible, and the type and degree of illumination was always noted on the record. Ophthalmoscopic studies were made with an unscreened battery ophthalmoscope, freshly activated, thus insuring uniform light intensity.

RESULTS OBTAINED.

The results thus obtained can be presented most succinctly in tabulated form, classifying on the basis of the endocrin focus involved. All were drawn from 155 cases of B series.

Table 1. Thyroid Dysfunction. 16 Cases. Positive Eye Findings shown in 7 cases:

Enlarged Blind Spots—	5	cases
Contracted Fields	4	"
Vascular Changes	1	"
Yellow Discs	1	"

Percentage of Positive Findings=43.7.

Of the five cases showing enlarged blind spots, three were bitemporal enlargements with normal nasal borders. The enlargements were all moderate, two degrees to five degrees at the widest point. Color fields were contracted concentrically in one case, while form fields were cut above in three cases. All seven cases showing positive eye findings were hypothyroid in type, and heavy lids obstructed upper fields somewhat. One case is of special interest, (No. 110, Fig. 11), which exhibited upper field cut to twenty-five degrees, and recovered full fields in three months under thyroid therapy.

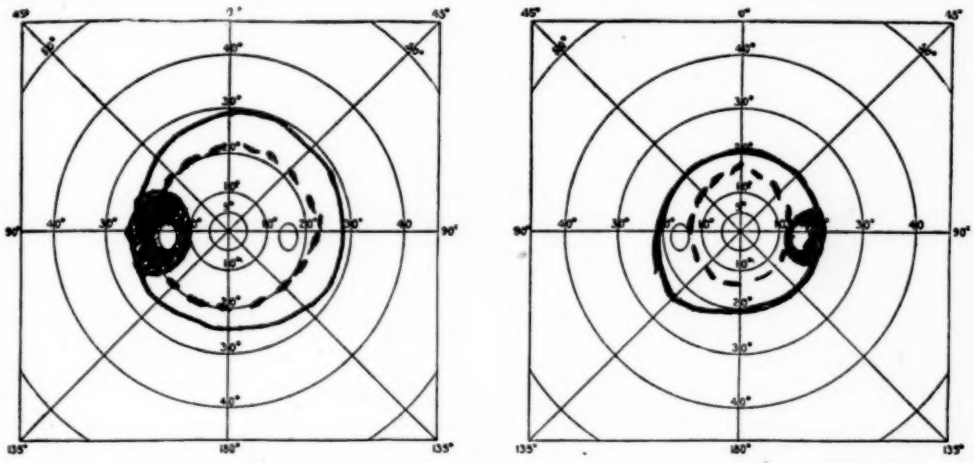

Fig. 5. Case No. B-217. Miss S., aged 18. Pituitary dysfunction. Ant. lobe underaction. Post. lobe overaction. Severe anterior headache, fatigue, obesity, nervousness. Sella normal. Discs yellow. Form field solid line; red, broken line.

Table 2. Gonad Dysfunction. 28 cases.
Positive Eye Findings shown in 10 cases:

Enlarged Blind Spots—	10	cases
Yellow Discs	3	"
Contracted Fields	5	"
Pigmentary Changes	1	"

Percentage of Positive Findings=35.7.

Nine of the ten cases exhibiting positive eye findings were females, of hypogonad type. Blind spots were all moderate enlargements; except one case, which had a right blind spot enlarged to eleven degrees diameter, and the left enlarged to nineteen degrees diameter. Field changes were all color contractions, concentric, except the one showing the very large blind spots, who had also some form field contraction. The pigmentary change was a "snuff fundus" case, with negative Wassermann.

Table 3. Adrenal Dysfunction. 5 cases.
Positive Eye Findings 4 cases:

Enlarged Blind Spots—	4	cases
Contracted Color Fields	1	"
Yellow Discs	1	"
Other Disc Changes	1	"

Percentage of Positive Findings=80.

The blind spot enlargements were all slight to moderate in degree. The color field changes noted in one case was somewhat irregular and more marked in the right eye. The case showing yellow tallow colored discs had normal acuity of vision, and normal fields except slightly bilaterally (temporal) enlarged blind spots.

Table 4. Pituitary Dysfunction. 98 cases.
Positive Eye Findings in 77 cases:

Enlarged Blind Spots	67	cases
Yellow discs	30	"
Other Disc Changes	6	"
Form-Color Field Changes	23	"
Scotomas	2	"
Vascular-Pigment Changes	4	"
Tumors	2	"

This group contains the major point of interest and demands further study. Blind spots were mostly uniformly enlarged binocularly, ranging from two to five degrees radial increase. The discs varied from *distinctly yellowish* to *yellow tallow color*, without loss of

substance. A few cases showed blurred disc margins, or indistinct discs. Field contractions were mostly concentric, some within the blind spot area. Two cases showed monocular macular lesions, producing small central scotomas. One hypophyseal tumor case exhibited a blind left eye and a temporal hemianopsia in the right. Another pituitary case with brain tumor showed papilledemas of five diopters right and seven diopters left. Autopsy disclosed a neurofibroma left cerebellopontine angle.

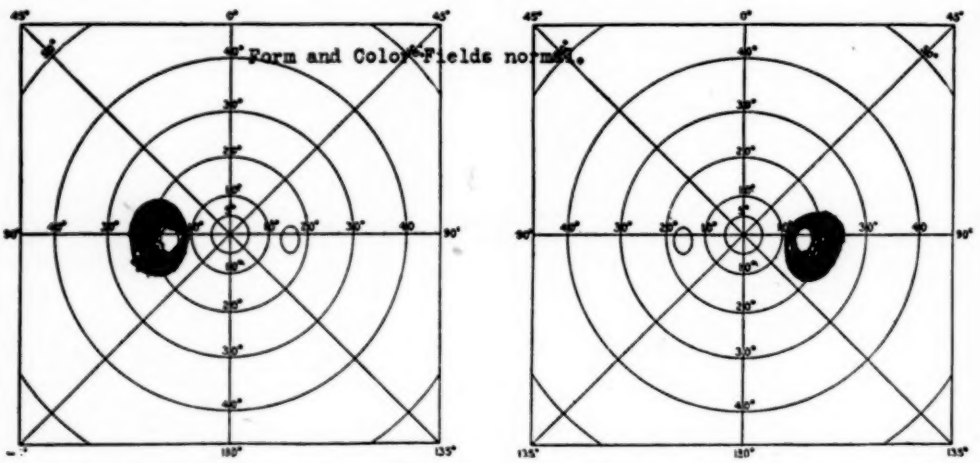

Fig. 6. Case No. B-270. Mrs. C., aged 36. Pituitary dysfunction. Ant. lobe underaction. Post. lobe overaction. Yellow discs. Sella negative.

Several cases have been tested after treatment and No. 71, (Fig. 2) illustrates a reduction in blind spot size after eight months pituitary gland therapy. Case No. 70, (7) is of special interest, having recovered in one year an almost totally lost left field to normal, and a reduction of the right blind spot under endocrin therapy for pituitary dysfunction, with anterior lobe under- and posterior lobe overaction.

had more complete and intense study by the entire staff of the Clinic; however, the percentage ran about the same in both B and S Series, so far as the eye findings are concerned. It is keenly appreciated that deciding whether a disc is yellow, taking into consideration the many factors entering into such a decision, is a point requiring sane judgment. Even so, exception may be taken to the observer's opinion in this connection.

Because of the anatomic relations, the pituitary cases are of greater interest and seem to offer more reason for the pathologic entities elicited in this study. Why blind spots should be enlarged more frequently than temporal fields should contract is not explained. Radiographs were taken of all cases, but their interpretation requires great care in relation to the individual, because of variations in age, sex, stature, etc. Correlations are under investigation at the present time and will be reported in a later paper. Further study is also under way with the pituitary group, and includes more exact field

Table 5. Summary of 155 B Series, and 125 S Series. Total 280 Endocrin Cases.

Positive eye	Thyroid	Gonad	Adrenal	Pituitary	Polygland. and Unclassified	Total
Findings	11	20	4	131	14	180
Normal Eye Findings	16	38	1	35	10	100
Total Cases	27	58	5	166	24	280

COMMENT.

Only cases from the B Series were analyzed in tables 1-4, because they

change measurements by the use of the Ferree perimeter, continued careful checking of blind spots on the stereocampimeter, analysis of radiographs of the sella, optic canals, and postnasal sinuses, and careful rhinoscopic examinations. Analysis of the findings thus obtained, with the subjective and objective symptoms manifested by the patient, in conjunction with the detailed vital function tests, may offer an explanation of the incidence of the various eye findings.

Previous work in this field by Erdheim and Stumme[13], Cushing[14] on fields in pituitary disease; Findlay[15], and Lancaster and Carvill[16] who found bitemporal cutting in pregnancy; by Benedict[17] who, among other factors in pituitary disease, described the yellow discs; by Hill[18] who, reports the occurence of enlarged blind spots in hypopituitarism, has been consulted.

The author wishes to express to Dr. Luther Peter his appreciation for kindly advice and encouragement in working out a large series of cases, and especially to thank Dr. A. W. Rowe and the Staff of the Evans for the privilege of participating in this interesting work.

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CHOKED DISC AND VITREOUS OPACITIES FOLLOWING FRACTURE OF THE SKULL.

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Choked disc after fracture of the skull is not uncommon. Retinal hemorrhage following such injury is more rare. The association of the two with vitreous opacities, as in the present case, appears unique. Read before the American Academy of Ophthalmology and Oto-Laryngology, October, 1925.

The presence of choked disc following fracture of the skull and intracranial hemorrhage is not uncommon. In fact, it is always looked for, and, when found, is of the greatest diagnostic importance. The appearance of retinal hemorrhage, with or without choked disc, in skull fracture is much rarer, and rarest of all is the presence of vitreous opacities.

In regard to the latter, the American Encyclopedia of Ophthalmology says[1]; "Interesting are those hemorrhages which occur after cutaneous burns, and those which follow compression of the thorax and of the neck, and blows upon the head. These hemorrhages may be in any layer of the retina, may remain in their original position, or may burst thru the lining membrane and fill the vitreous." Fox[2] says: "Hemorrhage into the vitreous is always derived from the vessels of the choroid, choriocapillaris or retina. Injury to the head or eyeball is the most frequent cause of this condition. Oftentimes, the hemorrhage is so large that the chamber is filled and the retinal reflex is absent or obscured." It will be noted that no mention is made in either reference to the presence of choked disc.

In this connection, two interesting cases have been reported, where the element of trauma was lacking, but where vitreous opacities were present accompanying increased intracranial pressure. Dupuy-Dutemps[3] reports the case of a woman who had an apoplectic stroke, followed by coma. The first examination of the eyes, three days later, showed large vitreous opacities with reddish reflex on oblique illumination. Since the condition of the disc is not stated, it is possible that it could not be made out on account of the vitreous opacities.

Van der Kooi[4] reports a case where the patient had been haying all day, following which he became unconscious, with Cheyne-Stokes breathing and convulsions. Rochat examined his eyes and found blood clots in the vitreous. So far as could be seen thru them, the retina was normal. In this case, also, the condition of the disc is not stated, but since the retina could be seen at least dimly, it is reasonable to conclude that there was no choked disc.

As to the cases with choked disc and retinal hemorrhages, without vitreous opacities, a few references will be sufficient. Dupuy-Dutemps[3] quotes several cases where there were papilledema and retinal hemorrhage, with hemorrhage into the sheath of the optic nerve, following intracranial trauma or other causes.

Knies[5] says: "If an intracerebral hemorrhage occurs . . . . the blood may enter the sheath of the optic nerve and produce changes that are visible with the ophthalmoscope (choked disc). . . . Choked disc, with or without retinal hemorrhage, is occasionally observed."

Panas[6] reports four cases of cranial trauma followed by bilateral hematoma of the optic nerves and edema of the discs, with retinal hemorrhages, seen during life.

de Schweinitz and Holloway[7] report a case where the patient was found unconscious. Ophthalmoscopic examination showed hemorrhages in the retina of both eyes. Postmortem examination showed fracture of the skull, intracranial hemorrhage, and the sheaths of both optic nerves distended with blood. They, also, review the literature.

From these and similar cases, it would seem that the choked disc which follows fracture of the skull is not due to increase of intracranial pressure, but is rather an actual penetration of the hemorrhage into the sheath of the optic nerve, where it causes a papilledema

by interfering with the return circulation. The retinal hemorrhages are the result of rupture of the retinal veins, or a penetration of the hemorrhage from the sheath of the nerve into the retina.

In none of these cases, and in none of the case reports in the literature to which I have had access, has there been the syndrome of skull fracture, choked disc and vitreous opacities. The infrequency of vitreous opacities following cranial trauma is evidenced by the paucity of references in the literature, which of itself would make the reporting of an additional case worth while. Furthermore, on discussing my case with several other oculists, I could find no one who could recall a case where the combination of choked disc and vitreous opacities followed skull fracture. This fact, added to the further one, that I could find no case reported in the literature, is the reason for reporting the present case.

CASE REPORTS.

Mr. M. L. N., white, age 32. In the latter part of 1923, the patient was thrown to the street by the sudden starting of a car which he was boarding. He was picked up unconscious and taken to a hospital, where he remained in a stuporous condition for some time. His history during this period was not available, but so far as I have been able to learn, the treatment was expectant, and there was no examination of the eyegrounds. An X-ray picture taken shortly after the accident showed a fissured fracture of the left side of the head, radiating from the vault to the base, thru the frontal and parietal regions.

About three weeks after the accident, Dr. Harry Jackson was called into the case. His examination showed extreme tenderness over the left side of the head. The pupils reacted to light and accommodation, but the vision was poor in each eye. There were no focal paralyses. The cremasteric and abdominal reflexes were absent on both sides, with a bilateral Babinski and ankle clonus. The spinal fluid was slightly yellow in color, and under increased pressure (20 mm. Hg.) After several lumbar punctures, with withdrawal each time of 20 c. c. of spinal fluid, the pressure returned to normal.

Dr. Jackson's report of the present condition of the patient, dated 18 months after the accident, states that "the patient fatigues easily, and has some tremor of the right hand. Babinski is no longer positive. He is unable to stoop or lift heavy objects. There is a considerable tendency to fits of despondency, and he is easily excited and becomes angry on slight provocation. Noises irritate him."

I was called to see the patient Dec. 10, 1923. Examination showed both eyes normal externally, with pupils dilated from the use of homatropin. A fair fundal reflex, obscured by opacities in the vitreous, was obtained from the right eye. View of the fundus was blurred because of large and small opacities, but it could be seen that the disc was in the stage of receding papilledema. In the left eye, the fundal reflex was obtainable only when the eye was turned to the extreme left. The vitreous was almost completely filled by a large mass of blood clot, possibly hiding a detached retina.

Vision could not be taken in either eye, but it was roughly large objects in the right and perception of light in the left. The treatment consisted of hot compresses of boric acid solution, and one drop of 5% dionin twice daily.

Two weeks later, the right fundus was still hazy on account of the vitreous opacities. In the left eye, there was a good reflex from the temporal side, but the nasal presented a grayish appearance, similar to a detachment of the retina. The dionin was increased. Four weeks later, both eyes were improved. In the left, it was evident that there was no detachment of the retina, but the disc could not be seen. Refraction gave V. O. D. = 6/12 nearly; with + 1.25 cyl. ax. 105° = 6/8. V. O. S. = Fingers 1 M.; with + 1.0 cyl. ax. 90° = 1/12. These were prescribed and the dionin increased to 10%.

March 7, 1924. V. O. D. = 6/8, no improvement with glasses. V. O. S. = 1/15, no improvement with glasses. Opacities decreasing in size and num

ber. July 25. V. O. D. = 6/6 nearly, no improvement with glasses. V. O. S. = 6/60, with —0.5 = 6/20. Aug. 28. Patient complains that at times a veil comes in front of the right eye, which is probably due to the accommodation, as there are no gross opacities. There is a large one in the left eye, directly behind the pupil, which prevents a view of the disc. On directing the eye to either side, the fundal reflex can be obtained. Under homatropin, V. O. D. = 6/15, with + 0.75 S. ⌒ + 0.50 cyl. ax. 90° = 6/6 with difficulty. V. O. S. = 6/60, no improvement with glasses. Fundus and vitreous of right eye normal. Fundus of left eye dimly seen thru large and small opacities.

Since the above date, he has been seen several times, the condition of the right eye remaining normal and the opacities in the left eye gradually becoming less. However, owing to the central position of the large opacity, the vision in this eye is about 6/60. He is able to do his work, but complains at times of a veil in front of the right eye. The treatment has consisted of hot compresses, with dionin in increasing strength, up to 20%. At no time have I seen in the right eye any area indicative of recent or earlier hemorrhage in the retina. The vitreous opacities in the right eye are certainly, and in the left eye are probably, from hemorrhages into the vitreous by way of the sheath of the optic nerves.

25 *E. Washington.*

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SENILE CATARACT EXTRACTION.

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The statistics for one hundred consecutive cases are here given with a statement of operations referred. Points of technic and complications are discussed with methods of meeting them. The results of operation are given. Read before the Ophthalmological Section of the Baltimore Medical Society, November 2, 1925.

This report includes the results that I have obtained in 100 consecutive operations for the extraction of senile cataracts performed at the Presbyterian Eye, Ear, Nose and Throat Hospital from October 24th, 1922 to August 4th, 1925.

As the interest in a statistical report of this kind centers around the accidents and complications that occasionally attend the cataract operation and cause unfavorable results, it is essential that the cases be of the general run of unselected patients and the operations consecutive; it is evident that statistics that do not embrace these two factors are misleading.

I prefer the combined noncapsular extraction because it is easy to perform, less hazardous and yields a vision equal to it if not better than any other operation. As many eminent eye surgeons have reported such good results obtained by the intracapsular operation I thought I would try it out. I had observed that capsule forceps, the teeth of which had become blunted by repeated boiling would, occasionally, fail to bite off a piece of capsule and that I could detach the lens and in some cases extract it with the capsule intact. To accomplish this result I used the forceps of Knapp in 26 cases and succeeded in extracting the lens

with the capsule intact in 9; in two cases the forceps would not take hold of the capsule and in 15 the capsule tore, usually, after the lens had been dislocated and was partly thru the corneal section; when this accident occurs the lens can easily be expressed and the capsule withdrawn. The removal of the lens with the capsule intact, by this method, has all the advantages of the operation of Lt. Col. Smith or of Barraquer and is without the disadvantages resulting from the traumatism of them. I believe that I could have extracted a larger number of lenses with intact capsules had I strictly followed Knapp's method. I will attempt to compare the results of the 26 above described operations with the 73 noncapsular ones.

The following summarizes the chief points of interest: White, Males, 54; Females, 35; Colored Males, 7; Females, 4. Age in decades: 5th, 4; 6th, 21; 7th, 44; 8th, 25; 9th, 5; 10th, 1.

Type of operation: Combined extraction, 99; Knapp's modified, 26; Simple, 1; Smith, 1; Subconjunctival injection cocain, 3; Nerve blocking, 3; Use of hook or loop, 5; Capsulotomy, postoperative, 4; Capsule forceps used, 65; Cystitome, 8; Irrigation Anterior Chamber, 59.

Complications: Loss of Vitreous, 8; Prolapse of Iris, 2; Expulsive intraocular hemorrhage, 2; Iritis, 5; Purulent infection, 1; Depressed cornea, 6; Striate keratitis, 4; Air in anterior chamber, 37; Blood in anterior chamber, 9; Restless patients, 15; Deafness, 4; Vomiting after operation, 2; Eversion of cornea, 2; Diabetes, 8; Accidental iridectomy with knife, 7; Prominent eyes, 4; Spontaneous expulsion of lens and vitreous, 2; Delayed union of corneal wound, 4; Delirium, 1; Glaucoma, 2; Optic Atrophy, 7; Chorioretinitic degeneration, 5.

Vision, whole group: 20/15, 8; 20/20, 12; 20/30, 15; 20/40, 14; 20/60, 4; 20/70, 6; 20/20, 2; 20/100, 3; 20/120, 10; 20/200, 10; Less than 20/200, 5; No record, 7; Blind, 4.

Vision after Knapp's operation: Nine lenses extracted in capsule, 20/30, 3; 20/40, 2; 20/60, 1; 20/70, 1; 20/80, 1; 20/120, 1. Capsules torn 20/15, 1: 20/20, 4; 20/30, 3; 20/40, 1; 20/60, 1; 20/100, 2; 20/120, 1; 20/200, 1. No record.

Ages ranged from 47 to 91 years; the decade of greatest number, the seventh, 44; the year of greatest number, sixtieth, 9. The second year of greatest number, the sixty-eighth, 8; average age of males 65.5 years; females, 61 years; combined 63.25; these figures indicate that cataracts develop 4.5 years earlier in women than in men, i. e. if correct ages were given; the excess of men who come to operation, 22%, even tho cataracts develop 4.5 years later in them than in women, must be due to the economic urge; men seek better vision as soon as cataracts impair their wage earning power. Diabetes is the most potent cause of the early development of cataract; this series contains eight cases, five of whom were women. Cataract has no preference for either eye, the right (51) and left (49) are about equally affected.

Irrigation of the anterior chamber with normal salt solution was employed 59 times: I always irrigate whenever there is blood, air or soft cortex in the anterior chamber or the cornea depressed; the gravity method is used in preference to the syringe and the flow is from within outward.

COMPLICATIONS. Loss of vitreous occurred in six cases, twice before the delivery of the lens and four times afterwards; in two cases the loss of vitreous seemed to be due to the type of operation, both were intracapsular, one a Smith and the other a Knapp; in the other four cases the loss was due to blinking the eyelids; as the loss of the vitreous was small in five cases all obtained good vision which ranged from 20/20 to 20/200; in the sixth case, a Smith, vision was fingers at five feet; there must be added two cases of spontaneous expulsion of the lens and vitreous which occurred immediately after the corneal section due, in one case, to a forcible squeeze of the lids and in the other to an intraocular hemorrhage.

Prolapse of the iris rarely occurs in combined extractions; incarceration of the iris in the corneal wound occurred twice but there was no actual prolapse of the iris; one case was a Smith operation with loss of vitreous; the pupil was displaced upward and had a half moon shape, an appearance that I have found in all of my Smith operations; In the other case patient gapped open the corneal wound several days after operation by exerting pressure on the eye with her finger.

Expulsive Intraocular Hemorrhage. This complication occurred in two cases, in one, a 74 year old woman, it occurred on the table; I made the corneal section and the lens in its capsule slowly rose and emerged followed by vitreous altho I tried to prevent it by drawing the lids apart; blood did not appear until the patient had been back to bed for a half hour; a later inspection of the eye revealed the usual picture, a blood clot protruding thru the corneal wound. The second case was in a large fat woman who vomited very forcibly 7 hours after operation; she experienced a severe and sudden pain in her eye while gagging and retching; shortly afterward blood oozed from under the dressing and inspection, the next day, revealed the usual picture; these eyes, as usual, became blind.

Iritis. There were five cases that developed pain several days after operation, which lasted about a day, and was followed by an excessive degree of lacrimation and ciliary injection and a delayed convalescence; in each case some lens cortex remained in the anterior chamber; in one, there was loss of vitreous and the loop was used to lift out the lens; in another, an old colored woman, who was nearly unconscious from the effect of HMC tablets, operation was not easy to perform; vision in this case was 6/200; the other four cases obtained a vision from 20/20 to 20/200; good vision is usually obtained in these cases altho a capsulotomy is usually necessary.

de Schweinitz says that postoperative iritis is a manifestation of infection and Lt. Col. Smith says that traumatism is not a factor in the etiology of iritis. He says, "Iritis did not follow in one in 500 cases in extraction of the lens in capsule thru an entire pupil which had not been acted on by a mydriatic—tho there must of necessity be much more bruising of the iris in the latter case than in the capsulotomy operation." He modified this view, later, by excluding the lens cortex and attributing the iritis to the presence of the capsule alone. My experience has been that iritis is very apt to occur whenever an operation does not run along smoothly and lens cortex remains in the anterior chamber.

Purulent infection occurred but once; the anterior chamber was not irrigated in this case; the cataract was mature and a clear, black pupil was obtained after extraction; the patient was an Italian and somewhat feeble; he complained of severe pain on the second day after operation; inspection revealed pus in the anterior chamber; blindness is always the result of purulent infection.

Depressed corneas. This occurred six times in patients above the age of 68 years; it did not occur once in 57 patients under the age of 68 years; these eyes usually have minus tension and are deeply placed in the orbit and the patients are rather feeble; loss of vitreous never occurs; the anterior chamber was irrigated in each case and all obtained good vision.

Entrance of air in the anterior chamber. This occurred 37 times and when using the capsule forceps which raises the anterior lip of the corneal wound affording an entrance for air; the cornea, owing to its resiliency, tends to resume its usual shape after sectioning and escape of aqueous humor; this it readily does when air enters the anterior chamber; irrigation should be employed.

Vomiting after operation. Fortunately, this occurred but twice; vomiting within 24 hours after operation may cause intraocular hemorrhage and loss of the eye; this happened in one case; in the other case, vomiting occurred on the second day and was not accompanied by violent retching and

gagging and the eye escaped damage. To guard against vomiting, I have the patient take a purgative two days before operation, a light breakfast on the day of operation but no lunch; no food or medicines are given for 24 hours after operation except milk and water; patients often complain of slight pain in the eyes the first night after operation but it is safer to let the patient stand this pain rather than run the risk of vomiting by the administration of drugs.

Eversion of the cornea. This occurred twice, once in a patient 81 years old who overlapped the cornea on the third day after operation, while the eye was being dressed, by blinking; the other case occurred on the table and was due to blinking. When recognized immediately the everted flap should be replaced and the upper lid drawn down over it; a patient, immediately after the cataract operation, can by squeezing the lids together alter the shape of the eye so that the margin of the upper lid gets behind the anterior lip of the corneal wound and everts it; this accident is also favored by a corneal section placed too far in the cornea.

Diabetes. There were eight cases; seven recovered with good vision, the other case had a diabetic retinitis; I have not found any difference between diabetic and nondiabetic patients as far as convalescence is concerned; they do not show a greater tendency toward infection and resolution progresses favorably.

Lost eyes. Four eyes were totally lost; two from intraocular hemorrhage; one from sepsis and one from loss of vitreous; the last case was a colored man who wore minus 12.00 glasses; he did not have any self control and suddenly squeezed just as I finished the corneal section expelling the lens and a good deal of vitreous.

Miscellaneous: Use of hook or loop. This was necessary five times; in three cases there was loss of vitreous; the fourth case was a hypermature cataract and the other case had posterior synechia. Accidental iridectomy with knife. This occurred seven times; it does no harm at all, in fact, it expedites the operation by performing two stages with one movement, however, it causes a ragged iridectomy and should be avoided. Lt. Col. Smith says that "This is the common accident of the beginner and is due to the heaviness of his hands which causes him to make a poor counterpuncture and at the same time pressure on the eye with the fixation forceps; this allows the aqueous to escape and the iris to bulge forward." It can be avoided by dilating the pupil and making the counterpuncture a little forward in the cornea.

Delayed union. Four cases; among the chief causes of this condition were loss of vitreous in one case; 2nd case; a woman struck her eye with her hand, on the seventh day, while brushing away mosquitoes, which gapped open the wound; 3rd case; a man with but one leg whose method of locomotion was somewhat like a crawl which required the use of his arms and occasional strain; 4th case, a patient 91 years old who would get out of bed and blink his eye during dressings; the vision obtained in these cases ranged from 20/20 to 20/200.

Postoperative capsulotomy. This operation is necessary in all cases that develop thick capsules which invariably occur in iritis and iridocylitis cases; it improves the vision; the use of capsule forceps, which removes a part of the anterior capsule, reduced the number of these operations to four cases.

Postoperative delirium. Delirium occurred in but one case but it was the most severe one that I ever saw; the patient, a white man, 49 years old, from North Carolina, had a severe hook worm infection and was very pale and emaciated; he had been blind for a year and at the conclusion of the operation became emotional; he said that "he loved everybody and felt like shouting;" we managed to get him to bed quietly and he did not attract attention until the fifth day after operation when he became drowsy and confused, altho it was in mid-day; he could not answer questions but picked at the bed clothes; toward evening he became noisy and restless and and it required several persons to restrain him, in fact, he became maniacal and struggled violently; the free use of H. M. C. tablets secured a deep sleep which lasted for 10 hours; upon awakening he was perfectly rational and there

was no return of the delirium; the eye that was operated upon was protected with an aluminum shield and was not injured in the struggle; the unoperated eye sustained an abrasion of the cornea. He recovered with good vision. The blood of this patient contained seven per cent of eosinophiles and hook worm eggs were found in the stools in abundance. The unusual features of this case were, the man's youth, 49 yrs. old; late onset, fifth day; occurrence in mid-day; severity of delirium and that only the operated eye was bandaged.

Fundal lesions. A large percentage of cataract patients have optic atrophy and senile chorioretinitic degeneration at the macula; these lesions were noted in but 12 cases but it is likely that a larger number would have been found if I had made an ophthalmoscopic examination in every case; I only examined those patients who failed to get good vision after operation; these lesions cannot be determined before operation when in a mild form; the usual tests, light projection and pupillary reaction to light are well preserved.

Visual acuity. This is the proof of the pudding and the end toward which all of our efforts are directed; four eyes were totally lost, 96, therefore, obtained some vision; altho record is lacking in seven cases it does not mean that they could not see; on the contrary, it indicates that they obtained some vision because patients having any condition that leads to blindness are apt to keep in touch with the hospital for some time; these patients left the hospital without having the initial refraction performed and did not return.

The first refraction, eight days after operation, usually reveals a vision of 20/200 or 20/100 which steadily improves and in six months is often 20/15; thus, the 28 patients, in this series, having a vision less than 20/100, are those that only had the initial refraction recorded or had a fundal lesion, while the twenty whose vision was 20/20 or better had their best refraction recorded some months after operation.

It is interesting to note that in the nine successful Knapp operations, that is, delivery of the lens in its capsule, only three obtained a vision of 20/30 while in the 17 cases with ruptured capsules five obtained a vision of 20/20 or better; in the combined noncapsular extractions, eight obtained a vision of 20/15, and twelve, 20/20; this shows that the combined noncapsular extraction can restore a vision of 20/15 in the cataractous eye and that it affords a better average vision than the intracapsular operations.

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RELATION OF THE APERTURE OF THE EYE TO OCULAR FUNCTION.

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In the eye the iris is the stop and the pupil the aperture of the optical system. With a convex lens one may illustrate the effect of partly covering the aperture when the eye focusses on the retina or in hyperopia, myopia or astigmatism. The effect of changing the shape of the aperture may also be studied upon diffusion images. Read before the Section on Ophthalmology of the College of Physicians of Philadelphia, October 15, 1925. (See p. 204)

For the purpose of this demonstration it is needless to go into a detailed deliberation of the phenomena of stop-apertures, but merely to review those facts which seem pertinent and lead up to the subject under discussion.

A diaphragm or stop is a necessary part of any well constructed compound lens system. There may be one or more, in front of, between, or behind the dioptric apparatus, and usually so placed that the optical axis of the system passes thru the center of the stop-aperture perpendicular to the plane of the stop. The purpose for which stops are used is to admit, as far as possible, only such portions of a pencil of rays as are desirable to participate in the formation of the image. These rays, which are allowed to enter the system and form the useful image, are called the effective rays.

Every point of the object is considered the apex of a pencil of effective rays, and the base of this pencil is formed by the stop-aperture. The aperture, therefore, is the common base of all the pencils of effective rays. If the stop-aperture is circular the base is circular in shape and, of course, the pencil is a cone; but it is obvious that whatever the shape and size of the aperture, so will be the shape and size of the base of the pencil of effective rays. A large aperture allows more light to enter the instrument, making a bright image, but with less definition. With a small aperture there will be more sharpness of detail at the expense of illumination.

In the eye the iris is the stop, and the pupil the stop-aperture of the system. The pupil, as we see it, is really a virtual image by the cornea and anterior chamber. It appears slightly magnified and pushed forward. The luminous pencils of effective rays, which enter the eye, are limited by this apparent pupil, called *pupil of entrance*, by Abbe.

In order to illustrate what is to follow, set up a simple optical system, consisting of a convex lens (about 10 D.), an image-screen of cardboard or ground glass and a small, round, luminous object. Consider the object (for example, a 1 mm. hole in some opaque material illuminated from behind) to be a point. Carefully center and arrange these so that the object and the image-screen are conjugate.

Now pass an opaque card across the lens, either in front or behind, but close to it, gradually covering the entire surface, at the same time notice the effect on the image. It will be observed that, while the illumination is decreased as more and more of the lens is covered, the size and shape of the image will be unchanged. Its form can be seen as long as any light whatever is allowed to pass thru the lens and the image finally disappears as a whole when the lens is entirely covered. As we are dealing with a limited phase of the subject, the aberrations are considered corrected and will be disregarded.

Note the effect on the image with a stop having an irregular, triangular, square, narrow slit or several apertures. So long as the object and screen are conjugate there will always be one image regardless of the number of apertures; its position on the screen will not change whether the stop-aperture is in the center or periphery of the stop; and its shape will be unaffected by the shape of the opening.

Almost exactly what occurs in this simple system takes place in an emmetropic eye. If an eye be emmetropic or made so with the proper lens, provided there is sufficient illumination,

neither the size, shape nor position of the pupil will interfere with distinct vision.

With a small pupil or stenopaic aperture there will be more sharpness of detail with less brightness; but when the aperture is very small, even tho there is adequate illumination, diffraction plays a part, which, according to Tscherning, begins to be effective when the opening is less than two millimeters.

Generally speaking, large pupils do not interfere with the highest visual acuity. There may be a certain amount of glare and aberration, but this is overcome to a great extent by the structure of the retina. In cycloplegia, with a very wide pupil, perfect vision can usually be given with the proper lens for both far and near. This is also very often true in cases of irideremia, per se.

Good vision does not depend on the shape of the pupil. In man, as in most animals, it is practically round, but in some of the lower animals the variability of the shape is no less remarkable than the size. This feature is sometimes made use of to distinguish certain zoologic characters. The pupil may vary even in the same animal as, for example the cat, where it contracts to a tiny slit in the light and dilates to a large circle in the dark. It is not uncommon to find 6/5 vision in ragged, irregular and displaced pupils, the result of disease, traumatism or operation. The same may be said of sharply defined opacities of the media when there is not too much obstruction of light. From this we can infer that an operator need not hesitate, from the standpoint of the ultimate usefulness of an eye, to give a large pupil, however irregular and displaced.

Continuing our experiment, move the image-screen, which we consider the retina, closer or farther away so as to represent hyperopia or myopia. Instead of being clear and well defined, the image is blurred or diffused. If the lens is round the blur-image or diffusion-image is round, because the rim of the lens acts as the stop-aperture. The size of the diffusion-image depends on the size of the stop-aperture and it increases as the distance of the screen or retina from the focal plane increases. In this way ametropia may be measured by the size of the diffusion-image.

If, now, we repeat what was done before with various stop-apertures, we see that the diffusion-image assumes the geometric form of the aperture; erect when the image-screen lies within the focal plane, as in hyperopia, and inverted when behind. This is because the rays cross at the focal plane. If we pass a card across the lens the effect on the diffusion-image is in an opposite direction when the distance of the image-screen is greater than the focal distance, and in the same direction when the distance is less. This same test may be done clinically to determine the form of ametropia, but it must be remembered that in an eye the movement is interpreted in an opposite direction. Illustrate Scheiner's experiment, which is performed with a stop having two apertures. There will be two diffusion-images, as in an ametropic or unaccommodated eye and if one hole be covered, either the image on the same side or that on the opposite will disappear according to the position of the image-screen; showing that when the image is not in focus its position *does* change with the position of the aperture. This is important, because if the image is formed anywhere except at the fovea the vision is peripheral and indistinct. Note the linear diffusion-image with a stenopaic slit aperture. With a central stop, which simulates an opacity in the media, its geometric form will be seen in the diffusion-image.

In every instance of the foregoing experiment, on accurately focussing the system, the image becomes clear, regardless of the shape or position of the stop-aperture. These observations indicate that all patients with ragged, misplaced and otherwise irregular pupils or opacities in the media should be most carefully refracted. No pains should be spared in the examination of these cases where the confusion may be such that the vision is lowered out

of all proportion to the error and surprising results are sometimes obtained with a good correction.

This experiment tends to explain some of the phenomena of diffusion-images for a single point. To produce the effect for the whole object, use instead of a single illuminated opening, a perforated figure. A cross formed by a number of small round holes will answer the purpose. With this object repeat all that was done before. What was seen when the object was a single opening and considered a point, now takes place for what may be considered each point of the entire object.

Unless the screen lies in the image-plane of the dioptric system a diffusion-image will be formed for each object-point. These diffusion-images will change in size and shape under the same conditions as in the previous experiment. When large enough to overlap each other the whole image becomes blurred. When a card is passed across the lens each image is eclipsed as before, but the general contour of the cross remains. In the case where a stop-aperture is interposed each blur-image takes the geometric form of the aperture. Incidentally, it might be said that the term *diffusion-circle* or *blur-circle* cannot be properly used unless the pupil is circular. When a stop having two apertures is placed before or behind the lens two diffusion-images will be formed; and, therefore, two complete crosses will be imaged on the screen. With a central stop each diffusion-image will contain a geometric figure of this stop.

Observe how, as before, on adding the proper correction or by placing the screen in the focal plane, each image-point of the whole image becomes clear and distinct. This is the reason why certain opacities in the media, which are a great source of annoyance to an ametrope, may be imperceptible to the same patient wearing his proper glasses. In emmetropia only when an opacity is close enough to cast a geometric shadow on the retina can its form be outlined by the patient.

Combine a cylinder with the spherical lens and see the effect with the stenopaic slit in astigmatism. In astigmatism the image of a point is a line—a diffusion-image—and the stenopaic slit aperture, when placed in the right direction, merely shortens this line in one principal meridian. It can produce no change in the form of the image in emmetropia. A circular stenopaic aperture will answer the same purpose, even better than the slit, because it need not be so accurately placed. A stenopaic aperture will clear the image in any form of refractive error, provided there is sufficient light, by cutting down the size of the diffusion-image; but where this is used as a test for visual acuity in ametropia better vision can nearly always be expected with the proper lens.

I wish to acknowledge my appreciation for the kind suggestions offered by Dr. Thomas B. Holloway.

2007 Pine St.

USE OF "AFENIL," A WARNING.

LEO L. MAYER, M.D.

ST. LOUIS, MISSOURI.

This drug has been used by injection for vernal conjunctivities. Experiments show that intramuscularly used in large doses it causes sloughing in rabbits. It must be used intravenously with great care.

Some time previous to the year 1920 the firm of Knoll & Co., of Ludwigshafen, Germany, placed upon the market a preparation known as afenil or chlorcalcium-carbonid, a double salt of calcium chlorid and urea, containing 11.42 % calcium and 68.28% urea put up in sterile 10% solutions, 10 c. c. to the ampule. Its indication was "for all forms of calcium therapy where prompt and vigorous results were demanded."

Being a German preparation the first reports of its use were by workers in

that country. Reference to the literature reveals that the drug was used most often in three conditions; viz. vernal conjunctivitis, bronchial asthma, and as a prologue to the use of salvarsan. G. Wiederman[1], B. Horvath[2], Wachtler[3], A. Egtermeyer[4], and Pichler[5] report its use in vernal conjunctivitis. K. Eichwald[6] tells of attempts in asthma, while Professor Stumpke[7] of Hanover gives an account of methods before salvarsan injection. Other papers of interest are by Spiethoff and Wiesenach[8] of Jena and by F. Molk[9].

Upon my entrance into the practice of ophthalmology, I learned of the use of afenil in vernal conjunctivitis. Because afenil is a calcium preparation, and serious results have occurred in the use of calcium chlorid intravenously. I recalled a case investigated during my internship; and the idea for this experimental work had its origin in that case. This case and the experimental work following the accident were recently reported in the Journal of the A. M. A. by Dr. M. G. Seelig[10]. My thanks are due to Dr. Moyer S. Fleisher for permission to further investigate this drug in the Department of Bacteriology of St. Louis University.

Four rabbits were chosen, and varying amounts of afenil were injected both intradermally and subcutaneously. Aseptic precautions were maintained and the following amounts were injected in isolated regions of the rabbit's body; 0.2 c. c., 0.4 c. c., 0.6 c. c., 1.0 c. c. and 2.0 c. c. After three days there was no inflammatory reaction noted in the doses up to and including 0.4 c. c. either subcutaneously or intradermally. With the 0.6 c. c. a moderate degree of induration was shown but no necrosis. Doses of 1.0 c. c. and 2.0 c. c. were accompanied by marked inflammation and actual necrosis, the 2.0 c. c. being of greater reaction. After a week in the 0.6 c. c. doses there remained only a slight inelasticity of the subcutaneous tissues. The 1.0 c. c. injection had caused a gangrenous slough 2 to 3 mm. about the size of a nickel and a like area the size of a half dollar about 4 mm. was found in the 2.0 c. c. injections. In another week's time the sloughs had come away in the latter two cases and healing had begun. No investigation with dilutions of the standard 10 c. c. preparation of 10% afenil were made during this investigation but undoubtedly they would lend value to the therapeutic use of the drug.

In the pamphlet of directions accompanying afenil there is a casual note to the effect that it should not be used subcutaneously but intramuscular injections are advised in certain conditions.

CONCLUSIONS.

1. The standard preparation of afenil must be used with great care when given intravenously.
2. Infiltration of more than .6 c. c. of the 10% solution of the drug into the tissues would undoubtedly result in necrosis and gangrene.
3. Intramuscular injections cause gangrene and may be fatal. Intramuscular injections of as little as 0.5 c. c. of the standard preparation cause gangrene and dissolution.

900 Carleton Building.

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NOTES, CASES, INSTRUMENTS

OCULAR COMPLICATIONS OF LEPROSY.

ADOLPH O. PFINGST, M.D., F.A.C.S.

LOUISVILLE, KY.

Read in the Eye and Ear Section of the Kentucky State Medical Association, Oct. 6, 1925.

It was my good fortune during the past summer to visit a lepra hospital. I had been traveling in Norway and just as I was leaving Bergen for London, to attend the International Congress of Ophthalmologists, I learned by chance that a large hospital devoted to the treatment of lepers was situated in Bergen. Thru the courtesy of the director of the institution I was given an appointment to make rounds with him at 7 o'clock on the morning of my departure. As I have in the thirty years or more of my study of medicine never seen a case of leprosy, I need not assure you that the visit was one of considerable interest.

The hospital in Bergen is quite a good-sized, two-story frame structure, built in a square surrounding a beautiful court of flower beds, evergreens and lawn. It is well equipped with pathologic and bacteriologic laboratories, operating and dressing rooms, a large library, private apartments for the medical staff and for the nurses, bath equipment, etc. The rooms are large and airy, some facing the court and others overlooking a surrounding park. Two to three patients occupy a room. Everything about the place was immaculately clean.

There were over 100 patients, and apparently the nodular or tuberous and the nervous or anesthetic types were about equally divided. With the one exception of a maniacal case, which was kept in a padded cell, the patients seemed uniformly cheerful notwithstanding their knowledge of the hopeless nature of the disease they harboured. The patients are allowed to intermingle in the court, at church service and during meals but are naturally not allowed to leave the confines of the institution. Upon inquiry the director advised me that the danger of propagation of the disease is very slight as long as the proper rules of asepsis are carried out. He expressed the belief that closeness of contact bears a direct relationship with contagion and hence patients were never allowed to occupy one bed, to shake hands, or otherwise come in contact with each other. In his experience of 33 years the doctor recalls but a single case, a nurse, who had contracted the disease while at the institution. Patients are visited twice daily in the institution. They are treated expectantly—necrosed bone removed, heavy layers of skin cut off and other symptoms relieved as they arise. General treatment seemed to be of no avail. Chaulmoogra oil, of which so much was expected, is no longer used at Bergen as no results were obtained from its use.

One could not but be impressed with the present status of leprosy and its management. When we see present conditions, where leprosy patients are kept under cheerful surroundings and are attended by a trained staff of physicians and nurses, and compare this to conditions as they formerly existed, the value of segregation becomes apparent. In the early and middle ages, when cases in Europe ran high into the thousands, lepers wandered about as outcasts and were condemned to live apart in huts or in open fields. They wandered about muffled from head to foot, a hood over the face and carrying a bell to give timely warning of their approach. Segregation has reduced the number of cases so that a case of leprosy today is almost considered a curiosity.

I was struck at once by the large proportion of eye affections among the patients in the Bergen Institution. It seems that this frequency of eye affections is common to all lepers, two-thirds to three-fourths of all cases having some form of eye complication and from fifteen to thirty per cent terminating in blindness. I was also impressed by the frequency of facial paralysis. It appeared as tho every second or third case had a unilateral facial immobility.

Naturally these cases were especially prone to eye complications. Many of them, on account of the inability to close the eyes and consequent exposure of conjunctiva and cornea, had a thickened dry conjunctiva (Xerosis). Some had symblepharon and quite a few had everted lower lids. The cornea was frequently involved, showing a peculiar infiltration resembling parenchymatous keratitis. Students of leprosy refer to these cases as "Leprous Keratitis." They run an acute course with conjunctival redness and involvement of the uveal tract, and leave a dense cloud in the cornea that at first appearance impresses one as leucoma, the result of a healed ulcer. Several corneas had punctate opacities, rather than the diffuse variety. Corneal ulcer is not so common, altho it occurs, especially in the cases with facial paralysis, and at times leads to perforation and destruction of the eye. The infrequency of corneal abrasion is especially to be wondered at, when one considers the frequency of anesthesia of the conjunctiva and cornea in the nervous cases.

Quite a few cases I saw presented a condition which seems to be quite common in leprosy, viz. the presence of peculiar jelly like nodes at the corneal limbus. They were yellowish and translucent and had a nodular surface. They showed a tendency to invade the cornea. The ones I saw all formed at the temporal edge of the cornea and appeared somewhat like a large phlyctenule in the precystoid stage. One case showed a similar node over the sclera—a little away from the corneal edge—and resembled the condition seen in episcleritis. These nodes are infective granulomata; and like the nodes found in the skin of lepers, resemble microscopically the nodes of tuberculosis and of giant cell sarcoma. Similar nodes have exceptionally been observed, tho infrequently, in the retina and choroid as well as in the iris. Uveal inflammation is common in leprosy, and sunken and soft blind eyes with occluded pupils are among the sequelae.

I was also struck with the large number of the nodular cases of leprosy which were associated with lid involvement. Many had tubercles, and these in their process of destruction and cicatrization caused ectropion. I saw quite a number of this kind. There were also several cases of entropion. Complete loss of the eyelashes and eyebrows was also noted in quite a few of the inmates.

712 Brown Bldg.

COLOBOMA OF MACULA ASSOCIATED WITH OTHER CONGENITAL ANOMALIES.

J. J. Horton, B.A., M.D.

EAGLE PASS, TEXAS.

Coloboma of the macula is of sufficient rarity to warrant the reporting of the following case:

L. S., girl, age 4, was first seen by me April 9, 1924. Her father is Mexican, her mother, Anglo-Saxon American. She was a full term, normal labor baby, has never had any serious sickness or injury and in her behavior is normal in all respects. I was consulted on account of squint.

The child had a very peculiarly shaped head, rather square with depressions and rounded elevations. The head was neither over- nor undersized. There was internal concomitant strabismus of 35 degrees, the left eye being preferred for fixing, but this preference was by no means great. Visual acuity could not be obtained on account of the patient's age.

R. Lids, conjunctiva, iris, pupil, cornea and other media, and disc were normal. Beginning about half a disc diameter directly below the disc and extending so far anteriorly that its limits could not be seen ophthalmoscopically was a coloboma of the choroid. It was triangular, rather than elliptical, in shape and occupied about the middle third of the lower half of the fundus. A little pigment was clumped irregularly along its edges and a few dots were scattered over the surface. The retinal vessels appeared to decrease somewhat in diameter as they crossed the coloboma. I do not know whether this illusion was due to difference in level or to color contrast.

In the region of the macula was a perfectly round, white, depressed area of half the diameter of the disc. The margins were smooth and gave one the feeling that the free edges of the retina and choroid had curled under. This area was pigment and vessel free. Taking into consideration the presence of the other anomalies, the history of a normal birth, and the absence of history of injury or disease, I am satisfied that I am correct in calling this a coloboma of the macula.

L. Lids, conjunctiva, iris, pupil, cornea and other media, and disc normal. This eye also presented a coloboma of the choroid similar in size and shape to that of the right, except that there was more pigment along the margins. The macula appeared to be normal ophthalmoscopically.

Several refractions under atropin:

R. +4.00 Sph.

L. +3.00 Sph.

Full correction was ordered. Neither glasses nor exercises with the Worth amblyoscope have had any effect on the strabismus, but improvement in visual acuity was proved by the fact that the patient will not do without the glasses. With the glasses on, the left eye was distinctly preferred to the right for fixation.

Examination of the eyes of the father, mother and three other children revealed no anomalies. The oldest child, a boy, was not available for examination. His parents said that he carries on his school work without any trouble with the eyes.

ZIEGLER THRU AND THRU OPERATION FOR TRAUMATIC CATARACT.

L. Waller Deichler, M.D.

PHILADELPHIA, PA.

Read before the Section on Ophthalmology, College of Physicians of Philadelphia, October 15, 1925. (See p. 204.)

The "Ziegler thru and thru, V-shaped operation" for traumatic cataracts, I believe to be rather more satisfactory than the ordinary linear extraction, which is so often performed; because, in my limited observation, one has as a final result, a round, mobile pupil, no postoperative reaction, the eye is less interfered with, and finally from the economic standpoint there is a great saving in time and expense to the patient.

Mr. J. K., 37 years of age, electric welder, by occupation, reported to me February 26, 1925, giving a history that on December 9, 1924, while chipping a piece of soft steel, a fragment struck his left eye. He had been treated, but no foreign body discovered, by first aid department at his plant and then at two hospitals in the city. His chief complaint was that he could not see well with the injured eye, but there was no pain.

Examination revealed 15/20 in the right eye and 2/70? in the left. There was slight congestion of the palpebral conjunctiva of the injured eye, with a small linear scar of the cornea, extending from 10 o'clock and 3 mm. inside the corneal limbus, almost to the center of the cornea itself, and another small linear scar just below the first. Directly behind this, a posterior synechia attached the iris to a yellow spot on the anterior capsule of the lens. The pupil was active to light. Tension normal. The lens was hazy with opacities in the posterior layers; and a linear tract of opacity extended from the yellow point spoken of to the posterior capsule of the lens, and in a slightly downward and inward direction. No view of the fundus details could be obtained. O. D. negative.

X-ray immediately taken, 5 plates in all, each of which showed a foreign body 10 mm. below the horizontal plane, 7 mm. to the temporal side of the vertical plane, and 8 mm. behind the center of the cornea. On March 7, a magnet operation was performed, using the Sweet magnet thru an open incision in the globe, as near the foreign body as possible; unsuccessful with the blunt point, a small long, thin point was inserted thru the wound into the vitreous and the foreign body removed, which measured 2.5 x 1.5 mm.

On the 18th day of April the V-shaped thru and thru Ziegler operation was done for the cataract, and on September 18, +11.50 Sph. gave him 20/20? sight.

Chestnut at 18th Street.

SOCIETY PROCEEDINGS

THE BROOKLYN OPHTHALMOLOGICAL SOCIETY.

May 21, 1925.

Dr. Ralph I. Lloyd, Presiding.

History of Ophthalmology in New York City.

Dr. Alexander Duane spoke of the establishment of the New York Eye and Ear Infirmary in 1820, at which time ophthalmology was still a part of surgery. In 1823 a treatise on the eye was published by George Frick, who had made eye work a large part of his practice. Shortly after this the knife needle was invented by Isaac Hays. The foundation for modern ophthalmology was laid down in the period from 1850 to 1860. In 1851 Helmholtz invented the ophthalmoscope and an American was the first one to demonstrate it at Moorfields'. In 1857 Graefe devised the operation of iridectomy for glaucoma and about this time he started his Archives. He also laid the foundation of perimetry, taking visual fields and describing hemianopsia. Donder's monumental work on refraction and accommodation appeared at this period. Between 1860 and 1870 the American Ophthalmological and the New York Ophthalmological Societies were organized. The former was the second ophthalmologic society founded in the world, being preceded only by Graefe's Heidelberg Ophthalmological Society. During this decade Snellen's test types, Helmholtz's physiologic optics and Jaeger's atlas were contributed. In 1868 Dr. Herman Knapp started his Ophthalmic and Aural Institute in New York and Drs. Mathewson and Newton founded the Brooklyn Eye and Ear Hospital. In 1869 the publication of the Archives of Ophthalmology began, with Dr. Knapp as editor. In this year also the Manhatten Eye and Ear Hospital was opened. This was a transitional period in medicine, antiseptic surgery having just been introduced. Some of the operators, among whom was Dr. Markoe, were still performing their surgical work by the old preantiseptic methods. The specialists were being taught by clinical lectures, attendance on which was not obligatory. The entire medical course could be finished in two years. Among the prominent New York ophthalmologists of this period were Agnew, Noyes, Derby, Mathewson, Kipp and Roosa. The last named was the advocate of the ophthalmometer and the opponent of cycloplegics. Dr. Gruening also belonged to this period. No great advances were made just at this time, the questions of cycloplegics and motor anomalies being the subjects of controversy. Two men who were storm centers at this time were Drs. Stevens and Knapp. The latter had derived his training directly from Helmholtz, Graefe, Bowman and Donders and had contributed to their discoveries. Among his students were such men as Drs. Gruening, Weeks, Marple and Holden. In 1890 the speaker obtained permission to translate Fuchs' text book and testified that it was a great privilege to be connected with such an eminent teacher.

Helmholtz and His Work

Professor J. P. C. Southall said that the history of physiologic optics began with John Kepler who had the first really correct idea of the optic systems of the eye. Christian Scheiner, a Jesuit priest, who afterwards took part in the trial of Galileo before the Inquisition, performed most remarkable experiments with the simplest of optic means. He measured the radius of curvature of the cornea by placing glass spheres of different sizes in the corner of the eye until he obtained similar images from the sphere and from the eye. He was the first to peel off the choroid and see the inverted image on the exposed retina. He and Kepler were the founders of physiologic optics, altho Alhazen, Porta Maurolycus and Leonardo da Vinci preceded them. Nothing of importance was accomplished until the beginning of the 19th century, when the work of Thomas Young was ushered in. He was the inspiration of Helmholtz, who refers to him as "That most wonderful investigator leaping before

his time." These two men, the founders of modern physiologic optics, were trained to be physicians and became great physicists. Recently the National Research Council appointed a committee on physiologic optics. This committee concluded that the greatest need was a modern text book. In 1921 the Optical Society of America decided to celebrate the centenary of Helmholtz's birth. It was proposed to make a permanent memorial to Helmholtz by translating his text book which should form a basis for further work. The work is being financed by Adolph Lomb, a true friend of science. There was some difficulty in deciding which of the three editions of Helmholtz was to be translated. The first—that of 1856—was the classical. The second—1890—was considered undesirable, because Helmholtz had turned away from physiology and towards electrodynamics. He had lost touch with the development in his field and it did not represent what he would have published had he kept abreast of the time. In 1911 the European publisher determined to bring out a third edition, reverting back to the first. It consisted of three parts, the first dealing with the dioptrics of the eye—of special interest to ophthalmologists—, the second, with physiology of vision and color vision and the third with the psychology of vision. The publishers decided to avail themselves of the best help that could be obtained, and the services of Allvar Gullstrand, J. von Kries and W. Nagel were enlisted. These men finished the work which is as modern and complete as any such treatise can be.

WM. F. C. STEINBUGLER,
Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Section on Ophthalmology.

DR. T. B. HOLLOWAY, Chairman.

October 15, 1925.

Xerosis Conjunctivae.

DR. LEIGHTON F. APPLEMAN presented a woman, aged 27 years, who showed xerosis conjunctivae. The lesions consisted of triangular white patches on the bulbar conjunctiva of each eye, most marked on the temporal side of the corneae. The patches looked not unlike unglazed white porcelain. The conjunctiva had lost its shining moist appearance, and was covered with dry, white foam. This could be readily removed with a cotton wrapped applicator, leaving the conjunctiva dry, somewhat toughened, and of a dirty white color, closely adherent to the globe. The condition had existed for about eight years, gradually becoming more marked. A culture of the secretion from these areas revealed a pure growth of xerosis bacillus.

This disease appears to be due to the drying of the epithelium, usually beginning in the exposed portion of the conjunctiva in the palpebral fissure. It is associated with a debilitated condition of the subject, or to a deficiency in certain dietary elements. In this case no such condition appeared to be present. The fact that it occurred in one of her age rendered it rather unusual.

Xerophthalmia and keratomalacia usually occur in poorly nourished children, and a very thoro study of this type of case was reported by Blegvad in 1924, who called attention to fat-soluble A vitamin deficiency. He gathered 148 cases of xerosis conjunctivae, of which 133 occurred in children and only 15 in persons over fifteen years of age.

Treatment has been without material improvement. The effect of radium or of vaccine is yet to be tried.

Xerosis Conjunctivae.

DR. FRANCIS HEED ADLER exhibited a case of xerosis conjunctivae in a girl aged 6 years, with duration of six months. Various local remedies had failed to make any impression on the growth. Smears and cultures from the growth showed the typical xerosis bacillus. In view of the fact that this is often associated with a vitamin deficiency, cod liver oil was ordered and exposures of Finsen light locally will be tried.

Discussion. DR. BURTON CHANCE inquired whether the appearance of the areas in Dr. Appleman's case had altered much while under observation, as he had not seen the eyes until tonight since he examined her at the Wills Hospital. At that time he regarded it as a case of lymphangiectasis. The areas were then not covered with the smegmatic substance nor were they as extensive as they are tonight. He had to admit that the present appearance could not justify such a diagnosis as that which he had made. Altho he had not seen such cases of xerosis of the conjunctiva as the two shown tonight, he had repeatedly had to treat xerosis of the cornea. In one case, a boy, whom he had shown to the Section, broad bands extended across the corneae totally obscuring the sight, but, by the preformance of iridectomies both above and below the bands, in the vertical meridians, useful vision was obtained thru the colobomas. A peculiar feature of the xerotic area is the strangely serrated or herringbone outlines marking surfaces. Such lines are distinct in the cases shown tonight and were pronounced in the corneal case cited.

DR. WM. ZENTMAYER said that many years ago he saw a case of xerosis in the infant child of a medical friend, where a diagnosis of absence of pancreatic function was made by the late Dr. Starr. The child died when about a month old, practically of starvation. No autopsy was made, so that the clinical diagnosis was not confirmed.

DR. EDWARD A. SHUMWAY said that Professor Fuchs in Vienna had had the opportunity of seeing many cases of xerosis of the conjunctiva in association with hemeralopia and recommended as very efficacious the addition of liver to the diet.

Ectropion of Lower Lid Corrected by Graft From Upper Lid.

DR. WM. ZENTMAYER exhibited a patient on whom he had corrected an ectropion of the lower lid, aggravated by a Maxwell operation, by using a skin graft transplanted from the upper lid, according to the method of Wheeler.

Contracted Sockets Operated Upon by Method of Wheeler.

DR. J. S. PLUMER exhibited two cases of reformation of contracted socket by the operation suggested by Dr. J. M. Wheeler. In one case, a man lost the left eye following ulceration and perforation of eyeball incident to chronic trachoma, and owing to contraction of the socket, could not wear an artificial eye. A good deep lower cul-de-sac was obtained with preservation of the caruncle. A month following operation the patient was able to wear an artificial eye with comfort and a good cosmetic effect was secured.

The second case, a woman aged 37 years, lost the right eye at the age of two, following injury with scissors. Enucleation had been done shortly afterwards. The socket showed a moderate degree of contraction due chiefly to two broad vertically disposed bands of scar tissue involving the conjunctiva of lids and fundus of socket in the inner and outer thirds. A reformed socket, smooth and entirely lined with graft, was obtained with deep cul-de-sac, except at the inner third, where the graft did not adhere to the orbital periosteum probably due to insufficient radical dissection at this point. Aside from some upward rotation of cornea of artificial eye, the result was satisfactory as regards the retention of the prothesis. The cosmetic result could be improved by having a special prothesis made. Slight postoperative contraction was seen, but not enough to endanger the desired result.

It is important, as emphasized by Wheeler, that there be wide dissection with removal of all scar tissue, thinning of lids, intact Ollier-Thiersch (dermal) graft smoothly covering a properly fitting large stent, proper pressure dressing and careful postoperative care.

Tuberculoma of Iris and Ciliary Body.

DR. BURTON CHANCE exhibited a young girl, aged 11 years, with tuberculoma of the anterior segment of the globe treated by injections of tuberculin, who was shown at the meeting of the Section in the spring, at which time there were present in the angle of the anterior chamber of the right eye

six distinct tubercular masses, one quite large mass pressing against the cornea. These masses had their bases in the ciliary body and extended over the face of the iris. The pupil could be expanded somewhat but the deeper media were too cloudy for definition of the fundus. There were deposits on the capsule and on the endothelial surface of the cornea. Under injections of tuberculin, the ciliary region is apparently free from the nodular masses, altho the iris has become degenerated and adherent to the lens, so that no reflex from, nor view of the fundus can be obtained. Light perception was preserved. The left eye has not been affected and there have been no signs of general tuberculosis. The initial dose of OT was 1/500 Mg. continued until October 10th (at which date 1/250 mg. was the dose). At no time was there any marked reaction; once the temperature reached 100.2° at another time 100.3°.

The case is in marked contrast with that of a young mulatto woman shown to the Section a year or so ago, in which so violent a reaction followed the cautious injection of 1/10,000 mg., that the ocular signs rapidly increased, the masses seeming to have grown larger overnight and the onset of glaucoma demanded the immediate removal of the globe.

Tuberculous Keratitis.

DR. WARREN S. REESE exhibited a girl, aged 5 years, with a definite family history of tuberculosis. She had tuberculosis of the right hip eighteen months ago, the hip now being ankylosed. The right eye presented a number of various sized infiltrates in different layers of the cornea, most of them being deep. These are mainly in the lower third of the cornea and have the peculiar mutton fat appearance that is so characteristic of tuberculosis. There is a posterior synechia up and in, but little inflammatory reaction. Since first seen late in September last, the condition has shown little change. Tuberculin was not used. Dr. Ralph Tyson, who kindly saw the case, advised against it fearing that it might stir up the hip condition which is now quiescent. He hopes to arrange for heliotherapy in the near future.

Muscle Recession for Correction of Squint.

DR. WARREN S. REESE reviewed the various operative methods of correcting squint and called attention to the shortcomings of tenotomy. He proposed an operation in which the tendon is severed at its insertion and sutured to the sclera back of this point, a new insertion being thus effected. Three consecutive cases were briefly described and conclusions drawn as to the advantages of the procedure, especially when combined with some operation on the antagonistic muscle of the same eye.

Retinal Degeneration.

DR. WM. ZENTMAYER exhibited a girl aged 21 years, with a history of gradually failing vision, unimproved by glasses. There was no headache, no mist before eyes, and no pain. Sight was poor at school and tests then failed to improve the vision. She is apparently in good health. She had a very severe case of whooping cough at eight years of age, followed immediately by measles. In the same year she had mumps with abscessed ears. She had never been seriously ill otherwise, and has never had scarlet fever. The family history is negative except that a paternal grandparent suffered from diabetes, and that a brother died of tuberculosis of the throat, but there had been very little exposure at any time and none after he became actively ill. There was no record of blindness or hereditary eye trouble and no blood relationship in parents or ancestors. V.O.D.=3/80; O.S.=5/9. Light sense, O.D.0.8; O.S.0.9. In the right eye the papilla is nearly round with medium sized excavation. In a broad zone encircling the papilla and macula there are crescentic, round and macular shaped, pale yellow lesions, from one to several times the diameter of the central artery. In the vicinity of the temporal vessels they coalesce to form continuous bands. They lie altogether beneath the retinal vessels and are less conspicuous along the inferior vessels. There is no pigment either in

relation to the spots or elsewhere. There are pale, not very definite changes at the fovea. The outer half of the papilla is gray and the vessels possibly a trifle reduced in diameter. There is the same general appearance in the left eye, altho the lesions are not so pronounced and show less tendency to linear formation.

This patient presents a retinal picture which does not conform to any typical form of degeneration with which we are familiar, but resembles an atypical circinate degeneration or retinitis circinata described by Bachstez and Harms, in which the zone affected has for its center some other point than the fovea. Whether this is actually a case of socalled retinitis circinata may be questioned. In retinitis circinata the disease occurs usually in the middle or in the advanced years of life, is more often unilateral than bilateral, and the lesions have a more definite, limited and characteristic configuration than the case exhibited, at least in advanced cases.

The points in which it resembles circinate retinitis are that the component lesions are yellowish or creamy, are small and well defined, are situated beneath the retinal vessels and show a tendency to confluence in mass and to follow the temporal vessels; no pigmentation is present. There is likewise an indefinite yellowish macular area. Central vision is greatly affected; the peripheral field shows little change and there is a relative central scotoma. There is no night blindness.

Dimmer, who has described the variations which have been met with in the outstanding feature of the fundus changes, states that the girdle shows many variations in its composition, form and relation to the macula. At times spots of the same color and form are found outside of the girdle, even in the nasal part of the fundus, thereby greatly modifying the ophthalmic picture. The girdle does not always end at the disc but may reach above and below the vertical diameter or even circumscribe it, reaching the nasal fundus, so that the papilla comes to lie within the girdle. This is the distribution in the case here shown.

Pemphigus of Conjunctiva.

Dr. Wm. Zentmayer exhibited a case of pemphigus in a male aged 40 years, who was seen at Wills Hospital, September 4, 1925. The disease appeared two years previously when both eyes began to itch, especially inside the lower lids. Some redness was noticed. These symptoms were intermittent but grew progressively worse until about one year ago. Since then there has been little or no change so far as he can tell. About the same time that the eye symptoms began, the patient noticed that his nostrils were filled with crusts a great part of the time, causing considerable difficulty in breathing, more marked at night. In the right eye the sac was negative; puncta somewhat small; some loss of cilia of lower lid, which are irregularly placed; a few very small patches of xerosis at outer third of inner border of lid; almost complete obliteration of cul-de-sac by adhesions between palpebral and ocular conjunctiva; moderate injection extending upward to lower limbus; patchy scarring of conjunctiva of upper lid with bands on either extremity of tarsus extending to bulbar conjunctiva, giving the appearance as if the tarsus were being snared off; slight injection of bulbar conjunctiva; cornea clear; anterior chamber of average depth; pupil round and reacting to light and convergence; media clear; fundus negative. The left eye showed some loss of cilia of lower lid; obliteration of lower cul-de-sac except for middle third, which is moderately shallow; pearly white patches of xerosis between outer third of lower lid border and cornea; grayish red membrane covering outer fifth of cornea from one to five o'clock; considerable thickening and scarring of conjunctiva of upper lid with appearance similar to that of right eye. Pupil normal, but smaller than that of right eye; media clear and fundus normal. The laboratory report showed no skin manifestations of pemphigus, but the nasal lesions suggestive of lues. Wassermann + + + +. Differential blood count; poly. 65%; lymph. 25%; mono. 3%; eosin. 2%; trans. 2%.

Pemphigus of the conjunctiva is a rare disease. In the past thirty years I can recall but two or three cases shown at this Section, and this is the only case that I have had in my practice.

Aside from the absence at the present time of vesicles the symptoms both subjective and objective are those of pemphigus. The membrane forming at the outer part of the cornea in the left eye is probably the beginning of a process which may in time involve the entire surface. Little mention is made of the condition of the palpebral conjunctiva in the description of the disease. In this patient there is decided thickening of this portion of the membrane with dense cicatricial bands running transversely across the tarsus.

Eberson claims to have isolated an organism from the blood of seven patients suffering from general pemphigus and this has held out a hope that the same organisms might be found in the blood of patients with ocular pemphigus. Dr. Kolmer, however, states that repeated efforts on his part to corroborate Eberson's findings have all failed.

Several of the cases reported have had positive Wassermanns as in this case. It may be that syphilis is a contributing cause of this condition, as St. Martin claims that these patients are all syphilitic.

Stieren believes that pemphigus and essential shrinking of the conjunctiva are different diseases. He says that the palpebral conjunctiva rarely suffers in pemphigus. Some dermatologists contend that skin pemphigus and conjunctival pemphigus are different diseases.

Benedict claims to have obtained benefit for some of the symptoms by using a vaccine of the xerosis bacillus taken from the conjunctival exudate. In some instances radium has been of apparent benefit.

Discussion of Dr. Zentmayer's two cases. Dr. H. Maxwell Langdon said that altho the case of retinal degeneration was not typical of circinate retinitis, it was not typical of any other form of retinitis. The idea occurred to him that it might be a form of retinal degeneration in which pigment migration had not yet started. It may be that these forms exist at least for some time before there is sufficient breaking down of the cells to allow the pigment to wander from its normal position. Dr. Zentmayer stated that there was a slight deficiency of the light sense which would of course tend to confirm his diagnosis of retinitis circinata.

Dr. H. Maxwell Langdon thought the second case presented by Dr. Zentmayer was undoubtedly one of pemphigus of the conjunctiva. He had seen two cases, one of which was under his care now, and both of them have had general as well as ocular involvement. Inasmuch as many of these cases have general involvement it seemed to him rather peculiar that Dr. Schamberg believed that pemphigus of the conjunctiva and general pemphigus were two separate conditions.

Dr. Langdon said that a year ago last June, at the meeting of the American Ophthalmological Society, Dr. Benedict, of Rochester, Minn., in discussing Dr. Clapp's case of pemphigus, mentioned that in certain cases of his own, xerosis bacillus had been found in great numbers from which a vaccine was made and used to advantage. It occurred to him that if a vaccine would ever be useful it would be in cases like Dr. Appleman's and Dr. Adler's.

Dr. Edward A. Shumway said that he had seen three well marked cases of pemphigus of the conjunctiva and in only one was there any skin involvement, which tallied with the usual experience in these cases, mucous membrane involvement of the nose and throat being the much more common accompaniment. In one case syphilis was present, and he thought this was an important factor as the pemphigus might be a late manifestation of this disease and appropriate treatment against it should be instituted. In one of his patients there had been involvement not only of the mouth and pharynx, but also of the mucous membrane of the bladder.

Dr. William Campbell Posey said that he thought the case one of essential shrinking of the conjunctiva. This condition must be differentiated from

that of pemphigus of the skin with ocular manifestations. He had recently reported a case of this latter type in an asthenic individual who had recently died. This characteristic of ill health is a dominant feature in the skin disease. The long duration of the affection in the case under discussion, without corneal complications, is against its being trachoma. The history was negative regarding the possibility of any burn of the conjunctiva by cauterizing agents. He had seen but one other instance of essential shrinking of the conjunctiva in his practice.

Dr. Burton Chance said that he had observed several cases of pemphigus and would not class Dr. Zentmayer's case as trachomatous, altho he was at a loss to account for the free discharge collected on the tarsal structures.

Dr. Zentmayer, replying to Dr. Langdon, said that it is because ocular pemphigus is so rarely associated with skin pemphigus that the doubt as to their being the same disease exists. A less forcible reason advanced is that patients with skin pemphigus usually die of the disease, whereas there is no mortality in ocular pemphigus. The patient exhibited is receiving active antisyphilitic treatment and under the care of Dr. Lane radium is to be tried.

In regard to Dr. Langdon's idea in the case shown as circinate retinitis, Dr. Zentmayer thought that if it were an early stage of retinitis pigmentosa there would be night blindness, which is not present; altho there was insignificant diminution of the light sense. Also the peripheral field was normal in extent.

Result of Ziegler Thru and Thru Operation for Traumatic Cataract.

Dr. L. Waller Deichler exhibited a case in which a V shaped thru and thru Ziegler operation was done for traumatic cataract with excellent results. (Reported in full, page 197.)

Discussion. Dr. S. Lewis Ziegler said that the principle of the complete discission applies to traumatic cataract just as well as to any other type of soft cataract. In order to escape all postoperative trouble, it is only necessary to open freely both the anterior and the posterior capsule and to avoid any injury to the iris or to the ciliary body.

Retrobulbar Neuritis Followed by Optic Atrophy Due to Frontal Sinusitis.

Dr. L. Waller Deichler presented the case of a man, 42 years of age, who showed true retrobulbar neuritis. (To be reported in full.)

Discussion. Dr. Robert J. Hunter said that the case illustrates the benefit that may occur in retrobulbar neuritis, when a distant source of toxemia is removed, such as teeth; from depletion after operation on the normal posterior ethmoids; from removal of the focus in the frontal sinus.

Dr. William Zentmayer said that he was a friend of the operation, but he thought it should be stated that occasionally there is a marked reaction. In one case already mentioned in discussion, it was quite severe. Furthermore increased tension frequently occurs. The patient should not be discharged too early in the belief that this complication does not arise.

Relation of the Aperture of the Eye to Ocular Function.

Dr. Alfred Cowan gave a demonstration on an optical bench of the effect of the various shapes and sizes of a stop-aperture on the image when in focus, with comparison between this simple system and an emmetropic eye, which showed that good vision does not depend on the size, shape or position of the pupil. He also showed the effect of a stop aperture when the image-screen does not lie in the focal plane, with illustration of diffusion-images in ametropia, showing that the vision of patients with irregular or displaced pupils, or opacities in the media, may be lowered out of proportion to the refractive error. (See p. 191.)

C. E. G. Shannon,
Clerk.

SAINT LOUIS OPHTHALMIC SOCIETY.

April 24, 1925.

Dr. J. F. Shoemaker Presiding.

Iridectomy With Winged Incision (Luedde) in Glaucoma.

Dr. John Green, Jr., read a paper to be published in this Journal.

Discussion. Dr. F. E. Woodruff asked what advantage Dr. Green thought there was in this operation over the Lagrange in chronic or simple glaucoma.

Dr. E. C. Spitze stated that he had had some experience with this operation. It appeals to him as a safe operation. The conjunctival flap is not hard to make. The incision carries deep into the anterior chamber to the root of the iris, and there results a wider filtration area than in other operations.

Dr. W. E. Shahan said he had had no experience with Dr. Luedde's operation, but it appeared to him to be an excellent one. The technic might be simplified by making a small lance incision, doing a small iridectomy and placing the wings beyond the lance incision beneath the undisturbed conjunctiva. This would make sutures unnecessary.

Dr. M. H. Post said he had had some experience with this operation slightly modified. He recalled seven of these cases in the last year and a half. Two were done easily and nicely by graduate students with little experience in eye operations. The method used in all but one case did not include the scissors incision or the keratome, but it did include turning down of the Elliot flap. This is an important feature as it enables one to get far into the angle at the root of the iris.

In some cases the iridectomy has been narrow and in others broad, but in every case the tension has remained down. There has always been an excellent conjunctival bleb. In one patient one eye was iridectomized in the ordinary way: the tension returned to 40 (Schiötz) and has remained up. The other eye, operated upon by Luedde's method, has remained about 22 (Schiötz). The preoperative tension in these cases has varied from 55 to 75 (Schiötz). In two cases, in the presence of very high tension, a preliminary posterior sclerotomy was made. Both have done well.

He thought the ability to get at the root of the iris was perhaps the most important feature of the operation, which appears to be a real advance.

In one instance a cataract extraction was done 2½ months later. The wound gaped and refused to close for about three weeks. This was probably the result of the weakened condition of the cornea and sclera. In a similar case he said he would postpone the second operation until about six months after the original one.

Dr. A. E. Ewing asked why massage was used after the operation. It seemed to him that any kind of massage following operation tended to keep up the irritation instead of allaying it, and the natural tension would keep open any openings that had already been made.

Dr. Wm. H. Luedde made the following remarks: "It is very gratifying to find that the experience of those who have followed this operative technic more or less closely has been so satisfactory.

As stated in my first paper on this subject, I was coerced into the use of scissors for the lateral "winged" extensions from an original tiny keratome incision in the case of an unruly patient on whom I did an iridectomy for glaucoma. The unexpected excellent result following this operation led me to study the scar with the corneal microscope. I found apparent vacuoles or irregularities in density in the corneal scar. Thereafter, I employed this type of irregular incision in all such cases and included the conjunctival flap of Elliot for additional safety from postoperative infection. The results were uniformly good with the exception of one case where the iridectomy was followed by uncontrollable hemorrhages into the anterior chamber persisting for two weeks or more after the operation. As Dr. Green has emphasized, I believe that this combination of methods provides the least possible risk in doing an iridectomy for glaucoma. As to its good effect in providing for the escape of intraocular fluids, I learned most from the discussion of Mr. Treacher Collins at the time my paper was presented at Washington. He called attention to fundamental essentials for success in any glaucoma operation. He intimated that it was not necessary to follow any special method. Linear incision or trephining, or any other surgical procedure is likely to be good provided there is no

infection. It had been found that scleral and corneal tissue (when no infection is present) remains unhealed after incision just as iris tissue remains unhealed when the iris is perforated. You will recall that it was Fuchs' observations of that lack of healing that led him to do the double transfixion of iris bombé. Collins found that this same principle applied to the sclera or cornea if there was no infection present. For that reason a large conjunctival flap as an additional safeguard against infection is a valuable part of the operation.

The next point was that the endothelium on Descemet's membrane must be thoroughly divided in order to have continued low tension after an operation for glaucoma. If the endothelium has not been divided it has been found that intraocular fluids would not enter the interstitial layers of the cornea. Thus an intact endothelium absolutely blocked any drainage into the sclera or cornea or subconjunctival spaces. Mr. Collins gave this as his reason for preferring the trephine operation. However, when you enter the anterior chamber with a keratome incision and then tear up the ends of that incision by cuts with scissors, the endothelium is certain to be very thoroly divided. The tiny initial keratome incision avoids the dangers of too sudden a release of the intraocular tension incident to the trephining and greatly lessens the danger of late infection. Herbert has pointed out that the round opening after trephining is particularly liable to late infection.

I did not attempt to fix the methods of anesthesia nor insist upon placing the sutures. Dr. Green's suggestions in this line are admirable. Personally, I have found sufficient anesthesia by giving a hypodermic of morphin and atrophin beforehand and instilling cocain 4% with adrenalin locally. The subconjunctival injection of a drop of the same solution at the inferior limbus five minutes before making the incision as suggested to me by Dr. Flury has proved very helpful. I would prefer the use of novocain solutions to escape the toxic effect of cocain, if they are equally reliable."

Dr. Green said in closing: "Dr. Woodruff asks about the advantage of this operation over the Lagrange operation. Never having performed the Lagrange I can't speak with any authority. Luedde's operation has been designated by a member of our society a 'homeopathic Lagrange'. That seems to me to well express the effect of the operation. In the Lagrange you deliberately cut out a piece of sclera in order that there may be a large opening between the anterior chamber and the subconjunctival space. In Luedde's operation you create a rough, uneven wound which, in all probability, permits filtration after healing thru minute interstices.

Dr. Spitze has spoken of the safety of the operation. That is one of its most valuable features. Everything done to the eye is done easily and gently. The keratome incision is 3 mm. Properly performed it does not even release aqueous. The tension is gradually lowered by introducing an iris spatula into the chamber and turning it slightly. The effect is that of a paracentesis.

Dr. Shahan spoke of omitting the flap and sutures. I do not see how we can perform the operation at all if we omit the flap. In order to secure subconjunctival infiltration you have to make a flap.

One can illustrate the effect of pressure on the globe (massage) during convalescence by cutting a small wedge shaped piece in a hollow rubber ball. Pressure on the ball will cause one lip to override the other. That is what must take place, to a limited extent, in the eye—one lip slightly overrides the other, and perfect coaptation is broken. The massage does not irritate the eye. The flap held by sutures is not displaced.

Dr. Post speaks of the fact that the technic is not difficult. It is one of the easiest glaucoma operations and one enters upon it with a feeling of safety that one doesn't have with some others. My iridectomies have all been basal and wide. By securing complete anesthesia of the iris (novocain subconjunctivally or intraorbitally), it is possible to perform this part of the operation very deliberately for the patient has no pain."

Two Cases of Foreign Body in the Orbit.

DR. HUGO REIM related the case of a carpenter, struck by a splinter on the left upper lid. Shortly thereafter he observed a swelling just below the supraorbital notch. This gradually enlarged to the size of a small pea and was firm to palpation. X-ray examination was negative.

An incision released a few drops of pus but no foreign body could be found. A second exploration a week later led to the discovery of a piece of wood one cm. long which was removed.

The second case was that of O. S., who when 9 years old ran into a girl who had a handful of lead pencils, one of which struck him in the right eye. The little scratch healed promptly. Three years later a lump in the lower lid just above the margin of the orbit was noticed. A hard mass could be plainly felt. After cocainization of the conjunctiva, a short incision was made and the foreign body found. It proved to be a fragment of a graphite drawing pencil 3 mm. by 15 mm. After enlarging the incision the fragment was readily extracted. The wound healed in a few days.

JOHN GREEN, JR.,
Editor.

THE MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

October 13, 1925.

DR. HARLEY HARRIS Presiding.

Membranous Conjunctivitis.

DR. E. C. ELLETT presented a little girl, age 4, seen September 23, 1925, with a history of severe acute inflammation of both eyes since February 8th. She was treated by the family physician for a month and then by a specialist for four months with some benefit. He diagnosed her trouble as diphtheria. Two weeks before Dr. Ellett saw her she was taken to another specialist and was told that nothing could be done. Both eyes showed the same condition in different degrees. The conjunctiva was thick, red, rough and bled easily. There was a thick gelatinous membrane on each of the four lids. When it was removed the conjunctiva bled freely. Both corneae were vascular, like pannus. The right one was so bad that it was hard to tell where the cornea began. The photophobia was intense. The culture and smears have shown only ordinary pus organisms (Staph. and Strep.) She has been treated with various local applications and injections of milk, but did not improve until she was put on 1% optochin; since then the improvement has been very great. The eyeballs and corneae are much clearer and the lids less inflamed, but the membrane is still present.

Discussion. DR. J. B. STANFORD said that it was one of the most remarkable cases he had ever seen. One could not conceive the original condition as it was at present. The right cornea is like a trachoma cornea. In the left eye the membrane is hanging by one edge.

Injury to Cornea.

DR. J. A. HUGHES presented L. J. C., aged 24, a salesman and demonstrator for X-ray and ultraviolet machines who came under observation August 21, 1925, with the following history: While demonstrating some ultraviolet light, the tube exploded, not only striking him in his right eye, but burning it. The pain was very severe, and vision blurred. Photophobia increased each day, and he was not able to keep his eye open; when he did open his eyes, tears flowed.

On examination there was found a deep whitish grey ulcer, covering almost the entire cornea, especially the central part, with only light perception, which was lost in a few days. He is now totally blind. Under treatment of silver nitrat, hot compresses, atropin, injections of lactigen (milk) every four days, three doses up to date, the ulcer has disappeared, except a small spot on the nasal side.

Blood Wassermann was negative. Several abscessed teeth and diseased tonsils were removed. Patient's general health is good. Cautery will be applied to the remainder of ulcer.

Discussion. DR. A. C. LEWIS said that the case looked like an inter-

stitial condition, either tuberculosis or syphilis.

Dr. J. B. Stanford saw nothing to cauterize. He thought the treatment should be rest, hot applications and atropin and perhaps dionin.

Endophthalmitis.

Dr. P. M. Lewis presented C. B., colored girl, age 17, who was seen in the Eye Clinic of the University of Tennessee, first on August 31, 1925. She complained of a gradual loss of sight in the left eye, which she first noticed the latter part of June. There has been no pain or redness at any time. Three years ago she was struck in the right eye with a dynamite cap, causing temporary loss of vision, probably from hemorrhage. This eye returned to normal quickly and has given no further trouble.

The right eye was normal in every way with the exception of a foreign body, 3 x 1 mm. in size, imbedded in the conjunctiva and episcleral tissue, 3 mm. down and in from the limbus. There was no inflammation surrounding this and no importance attributed to it. It is probably a piece of the dynamite cap.

The left eye showed no sign of inflammation externally. The pupil was moderately dilated and reacted to light consensually but not directly. The vision was reduced to perception of light. The tension seemed normal to fingers in both eyes when first seen, but at present it is subnormal in the left eye. By the Schiötz tonometer it was 22 mm. O.D. and 13 mm. O.S. With the ophthalmoscope and also by oblique illumination a grayish yellow mass can be seen in the vitreous, apparently situated just back of the lens. A few red spots are seen on the mass but no blood vessels. Light perception was absent in the nasal and upper fields. Transillumination was negative.

The Wassermann test was negative. During the six weeks of observation of the eye there has been no change detected. No focus of infection has been found.

Discussion. Dr. J. B. Stanford suggested that it might be a tumor even without retina showing.

Dr. E. C. Ellett diagnosed it a plastic inflammation in vitreous.

Dr. A. C. Lewis asked as to the etiology of the inflammation.

Dr. P. M. Lewis thought that removal of the eye was indicated.

Monocular Diplopia.

Dr. A. C. Lewis reported this case. On August 22, 1925, Mr. W. T. C., aged 48, consulted him about the right eye: trouble of six weeks duration. There was an acute conjunctivitis of this eye with a small chalazion and two small ulcers on the conjunctiva of the upper eyelid. Vision was blurred and equaled 20/60.

While taking his vision, he discovered that he had a true case of monocular diplopia in this eye. Every letter on the Snellen charts at a twenty-foot distance was doubled, the two objects appearing side by side and nearly an inch apart.

Examination of the crystalline lens showed no abnormality either in position or in structure. The iris and pupil were perfectly normal in all respects.

He was refracted without a cycloplegic and glasses prescribed as follows: O.D. +1.00 Sph. with +1.75 cyl. Ax90°:—O.S. +1.00 Sph. Vision equals 20/15 in each eye. Since he has been wearing this correction the diplopia has disappeared and all other symptoms with it.

This is the only case of monocular diplopia caused by astigmatism he has seen. They are usually caused by a subluxated lens, lenticular changes in incipient cataract, iridodialysis or multiple openings in an iris.

Injury to Eye from Broken Spectacles.

Dr. J. B. Blue presented a pair of spectacles, the right lens of which has been perforated by a flying missile. This missile after perforating the spectacle lens entered the eye, going thru the cornea, wounding the iris at the pupillary margin, piercing the lens and was localized by X-ray 22 mm. deep in the globe. The foreign body which entered the eye and was recovered by a magnet was shown. It was a piece of steel 3 x 2 x 1 mm. The accident happened four days ago and the outcome is as yet undetermined. The spectacle lens is a minus 13 diopter lens

and is very thin at its center which was the site of the perforation.

Discussion. Dr. D. H. Anthony asked if the foreign body was removed anteriorly. He removes them posteriorly because he gets better end results that way.

Dr. M. B. Seligstein had a similar case three months ago which was removed posteriorly. Refraction two months later gave normal vision with correction. The eye is now blind.

Dr. E. C. Ellett remarked that it was strange for the glass to be perforated. It must have been struck exactly at a right angle. The eye does not look good. These eyes often do well for a while and then go bad. He saw a man today who has had a foreign body in one eye for seventeen years which has caused no trouble until the last few days when inflammation has set in.

Sarcoma of the Orbit.

Dr. P. M. Lewis made a further report of J. J., colored boy, age six, who was present at the August meeting of the society.

This boy was first seen August 11, 1925, at which time he had a marked proptosis of the right eye and apparently a tumor mass in the orbit. He was carefully studied in the children's hospital before the operation. The Wassermann reaction was negative. Thoro physical examination was made but no evidence of metastases were found. There was a small amount of mucopurulent discharge in the right nostril. X-ray pictures showed the right antrum and ethmoids cloudy and also very small frontal sinus.

On August 21st, an exploratory operation was performed. An incision as used for an external ethmoidectomy was made. A perforation about 10 x 15 mm. was found in the lamina papyracea of the ethmoid. The bone surrounding the perforation was necrotic as were the anterior ethmoidal cells and the lining of the frontal sinus. A small amount of pus was present. The diseased tissue was cleaned out and a large rubber tube put in the nose for drainage. The external wound was closed and it healed promptly.

He thought that perhaps the sinus disease might be responsible for the orbital swelling, but he was mistaken. No decrease of the proptosis occurred and a mass was still palpable in the upper inner orbital angle. One week later, August 28, 1925, he exenterated the orbit and found a large tumor mass filling up the back of the orbital cavity. The tumor had a grayish white appearance and was closely connected with and apparently infiltrating the internal rectus muscle. It had caused a necrosis of the roof of the antrum, but the growth had not invaded that cavity. The orbit and antrum were converted into one cavity and both thoroly cleansed. The hemorrhage from the ophthalmic artery and vein was easily controlled by means of packing.

A series of X-ray treatments was given by Dr. Pulliam, beginning one week after the operation. The boy was allowed to go home on September 10th, with instructions to return in three weeks for further X-ray treatments. Already, however, there was a mass of granulations, which had the appearance of a malignant recurrence on the median wall and a fatal outcome seems certain.

The gross specimen and sections stained with H. and E. were presented. The pathologic diagnosis was pleomorphic round and spindle cell sarcoma of orbit.

P. M. Lewis, Secretary.

ROYAL SOCIETY OF MEDICINE.

London, Eng.

Section of Ophthalmology (with the Section of Surgery).

November 13, 1925.

Sir Arnold Lawson Presiding

Traumatic Squint.

Mr. Malcolm Hepburn brought a lady patient who, 9½ years ago, fell in the hunting field and fractured the base of her skull. Hemorrhage occurred into the base of the brain, and both external recti were completely paralysed, the squint in each eye being 40 deg. He considered it would be safer to leave her without operation for a time. After a year he decided to operate, and did a very strong advancement and free tenotomy on the right eye, and, a

month later, on the left. He did not feel satisfied with the right eye, but the patient herself was very pleased with it. She got diplopia on distant vision, but as she was myopic to the extent of minus 8, she wore glasses, and by alternating them secured binocular vision. She was again able to hunt and play tennis, but last year she received a blow with a tennis ball in the right eye, after which she again squinted. Last year he did a readvancement and another tenotomy in the right eye. The cosmetic result was now good, she had no diplopia when reading, but she still had no external movement in either eye. He showed the case as an encouragement where the condition seemed fairly hopeless.

Cyclitis.

MR. W. M. B. OLIVER showed two bad cases of cyclitis. The first, in spite of everything he could do for her, got worse, therefore he sent her for ultraviolet treatment. Within a month of commencing that, there was great improvement; the pain disappeared and she felt much better and put on weight. Vision was now 6/6 in that eye, and there was no sign of injury or disease.

The second case was very similar, and since the ultraviolet ray treatment she had increased her weight by a stone. She was now having 20 minutes' exposure to the rays three times a week, and diathermy was applied direct in both cases over a pad of cotton wool soaked in saline.

Melanotic Tumor.

MR. T. HARRISON BUTLER showed a patient with a melanotic growth, with a year's history. The slitlamp showed it to be superficial. She had just one application of radium. He asked advice as to treatment.

Discussion. MR. PICKARD said that he had a similar case and excised it locally, and there was a minute return in the depth of the cornea. The electrician treated that recurrence with diathermy, resulting apparently in complete cure locally, tho there were enlarged glands in the neck. The patient died a year afterwards of intussusception, and no secondary growth was found at the operation for that.

Filament in Macula.

MR. WILLIAMSON NOBLE showed a case of filament in the macula in a patient with high myopia, and said the question was whether it was an aberrant hyaloid artery.

Discussion. MISS IDA MANN did not think this could be of the nature of an aberrant hyaloid artery, as it was a branch of the ophthalmia interna which entered thru the choroidal fissure, and it had been proved that the macular region had no relation to the position of the choroidal fissure, which always ran downwards.

SIR WILLIAM LISTER referred to Silcock's case which showed a very definite filament coming forward from a patch in the macula to the back of the lens, having just the appearance of a hyaloid artery. It was thought that in that case there had been an attack of inflammation at the site at a time—prenatal—when the vitreous had vessels, and that this vessel remained as an aberrant hyaloid artery.

Plastic Operations on the Face in the Region of the Eye.

The remainder of the evening was devoted to a discussion on this subject.

MR. H. S. SOUTTAR (Section of Surgery) in opening the discussion, said the general surgeon had not so much experience in operating in this region as had the ophthalmic surgeon, but there were one or two methods employed by the latter which he thought would be of interest to the ophthalmologist. He commenced to treat these cases when Dr. J. H. Sequeira, at London Hospital Skin clinic, began sending him cases of hairy moles of the face, some of them very extensive, and many involving the eye region. It was this latter feature which made the cases difficult, as anyone could treat cases on the face generally. With one exception, his cases had been in children, and in all he employed the arm-flap method. For most cases of plastic surgery in which a large flap was required, the tubular method, which had been developed by Gillies and Kilner, was the most potent, but he still held that in children the arm-flap method had great advantages. In a child it was easy, when the arm was thrown

over the head, to get the face practically buried in the shoulder, and if the hairy mole were dissected off and a flap turned off, a very large area of skin could be replaced. He showed a number of slides illustrating the various stages of the procedure, and said he believed the slight ectropion shown was due to injury of the orbicularis palpebrarum at the point, and possibly to interference with its nerve supply. In a case in which there was a very intense scarlet color, he reduced this to almost the normal shade by diathermy. The adult case, that of a man aged 21, he also dealt with by the arm-flap method. One case was that of a carcinomatous ulcer developing on lupus of the face, dragging down the angle of the mouth, and there was a considerable ectropion. The final picture of the case showed an excellent result. Recently he had found that it was not necessary to extend the arm to its utmost when taking the graft, as when that was done, sepsis was likely to occur in the cavity.

Mr. A. W. Ormond opened the subject from the standpoint of the ophthalmologist. To repair or replace either or both eyelids, to correct irregularities of the lids following cicatricial contraction which had led to exposure of the globe, entropion, ectropion, epiphora, or deformities of the lid margins, and to make or deepen a socket to permit of the wearing of an artificial eye, formed the major part of the ophthalmic surgeon's work in this connection. These defects might be brought about by direct injury, by destruction by acids or other corrosive substances, burns, ulcerative inflammations, or as the result of removing growths or malignant ulcers. The means available to meet these difficulties consisted of making flaps or grafts.

Flaps, consisting of the whole thickness of the skin, might be either pedunculated or nonpedunculated, and the pedicle could consist of flat skin, tubular skin, soft tissue, or a square base of skin.

Flaps when nonpedunculated might be autoplastic or homoplastic. In the case of pedunculated flaps the pedicle might be of skin, applied with its raw surface to the underlying tissues, in the same way as the main flap, and its object was to support the nutrition of the flap by connecting it with its original bed. Or the skin could be raised and rolled round on itself so as to form a tube, and the tube might be used as a nutrient bridge.

Jacobovici had laid down the following guiding principles for the cutting of flaps:

(1) The pedicle of the flap should be near to the area from which the substance had been lost.

(2) The long axis of the pedicle should correspond to the long axis of the flap in its new situation.

(3) When cutting the flap, it must be near the pedicle or a continuation of it.

(4) There need be no fear that the long axis of the flap will be too curved, for the skin's elasticity will cause the flap to take the desired direction.

In the case of "island flaps", in which the pedicle consisted of some soft tissues, muscles, etc., with a small arteriole embedded in it, when a bridge of skin remained between the defect and the flap, this was divided, and some tissue removed to form a bed for the pedicle. The flap could be made half the size of the area of the defect, as the latter was decreased in size in sewing in the flap. In nourishment and cosmetic effect the advantages of the "island" flap were striking, as no turned skin pedicle could be seen subsequently and the tension was equal everywhere.

Dieffendach's and Burow's methods of repairing the lids by the shifting of healthy skin in the neighborhood of the injury, were limited in their application, as they sometimes failed owing to considerable contraction taking place.

Nonpedunculated skin flaps could be obtained from a distance and placed in the areas prepared for them. They achieved their object under favorable conditions, but homoplastic grafts were rarely successful if they involved the skin, whereas autoplastic grafts were usually quite a success. The bed on which the graft was to lie should be moist, but free of oozing blood; and the graft should fit into its bed accu-

rately. All movement should be at a minimum, and firm bandaging and noninterference should last for several days. A flap fitting a raw surface with a subjacent bone or cartilage basis did not contract as much as when the bed consisted entirely of soft tissue.

Methods of dealing with a contracted socket still remained unsatisfactory, because substitution of the destroyed conjunctiva was very difficult. Mucous membrane grafts from mouth or foreskin could not easily be rendered aseptic, and owing to subsequent contraction but little might be achieved.

And he had found epithelial inlays disappointing when used for enlarging a contracted socket. He thought the ophthalmic surgeon usually began too superficially in these cases, and that one's first efforts should be to obtain a substitute for the globe, by inserting a cartilage, paraffin or filagree ball. The implantation of an artificial globe could be carried out in the way described by Webster Fox in the *Ophthalmoscope*, vol. VII, 1909, p. 10; and if the globe was present at the time, a thin convex or curved stent covered with a Thiersch graft had more chance of remaining stretched and of lining a cavity which would remain of a considerable size. Paraffin balls he regarded as the most useful.

In cutting Thiersch grafts he preferred a blade an inch wide, and kept both blade and area moist with sterilised normal saline irrigations. The knife should be used with a sawing movement, and kept as horizontal as possible.

As to the wound to be grafted; all granulations should be completely removed with a curette or scissors, perfect hemostasis should be obtained by pressure, the grafts should be cut as thin and as large as possible, and when transferred to the prepared surface, the manipulation should be the minimum. It should be covered with dry gauze and cotton, and left untouched for a week. After that interval, the dressing should be removed by soaking for as long a time as needed to float off the wool and the gauze; this time might be as long as half an hour, even an hour.

In deciding which method to apply in a given case it was important to consider the length of time which would be involved, and the number of operations which would be required in order to achieve the end, as well as the position in life of the patient. He urged that these cases should not be looked upon as merely opportunities for the exercise of one's surgical skill, but primarily from the patient's standpoint. When there did not exist any circumstances to limit the surgeon's decision, the method should be employed which gave the nearest approach to the normal.

Mr. T. P. Kilner, in the absence of Mr. Gillies, spoke of the methods carried out at the hospital at Sidcup, and exhibited a series of slides to show the various stages. The methods included that of the epithelial outlay. In two cases there was severe symblepharon, and Thiersch grafts were used both on the globe and on the inner aspect of the adherent eyelid, successfully. In the second case there was no fixed mould, but a small shell like structure was used composed of gutta percha, this being made to fit into the normal upper sulcus, and into the newly fashioned lower sulcus. The result was perfect. With regard to replacing lost eyebrows, in badly burned cases it was found that normally the eyebrows had three functions: to shade the eye from the sun, to act as sweat collectors, and to protect the eye from wind. One or two of the officers at Sidcup who had lost their eyebrows complained that when they perspired, as when playing tennis, the sweat ran into the eyes. Eyebrows could be made of a whole-thickness graft of hair bearing skin, taken from the scalp, or from flaps based on the temporal or other artery, and in making the choice an area should be taken where the hairs were growing in the desired direction.

Mr. G. H. Pooley (Sheffield) said that the conditions for which plastic operations were usually required were those involving extensive loss of skin, with or without loss of soft parts, with perhaps bone. These losses were due to (a) the surgical removal of tumors, etc. These cases were not generally septic; (b) fairly clean accidental wounds; (c) burns caused by molten or very hot metal, electricity and by

chemical agents, these wounds being followed by contraction; (d) septic conditions in which there was extensive sloughing.

In cases in group (a) plastic operations could be done immediately if the base was satisfactory and the patient's condition warranted it, or as soon as possible, before any shrinking occurred. In class (b) the operation could be done as soon as the wound was clean and quiet, but in (c) not until contraction of the scar had ceased, or nearly so. In the last group of cases operation must be deferred until twelve months after all sepsis had ceased.

When operating for any but recent injuries, it was best to incise the skin about ¼ inch from the palpebral opening, parallel to the margin of the eyelid affected, to divide all cicatricial bands and retract the cut surfaces as far as possible before putting the fresh flap in position. He had found a large flap on a wide pedicle the most satisfactory, and it should be large enough to fill the space to overflowing. He liked the subcutaneous tissue to fit freely into the space prepared for it. When repairing the lids, he usually sutured the two lids together without cutting them, so as to keep the eyelids closed and motionless during the healing process. If the vitality of a flap looked at all doubtful, he used hot boric fomentations for the purpose of keeping it warm. He did not sterilize the skin with iodin, as he found it to be too irritating to the conjunctiva; he used a mixture of methyl violet and brilliant green in dilute alcoholic solution, the formula being methyl violet ½%, brilliant green ½%, spirit. vini rect. 35%, aq. dist. 64%, and he found that it gave quite satisfactory results.

A modified long temporal skin flap could be used in cases in which there was a badly contracted socket. The conjunctiva was cut thru from the inner to the outer canthus, the cut being continued thru the skin outwards from the margin of the orbit, or two lateral incisions at the margin of the orbit, to allow room for the insertion of the flap without cutting thru the outer canthus. The conjunctiva was dissected up and down, and formed the palpebral conjunctiva, the base of the socket consisting of skin from the flap.

One of the most troublesome conditions was an extensive adhesion of the eyelid to the eye, particularly when a large part of the cornea was involved. A few years ago he tried the following method for these. He divided a gross adhesion of the lower lid to the lower two-thirds of the cornea, and cut thru the tissue which obliterated the lower fornix of the conjunctiva, cutting freely to each side, and continuing the incision below until about ¾ inch below the original bottom of the fornix was reached. He then sutured a layer of rubber sheeting into the wound, so as to keep the two raw edges apart. He left it *in situ* for a month, until epithelium had grown over the raw surfaces. He had shown results of the method at a meeting of the North of England Ophthalmological Society, and they were pronounced very satisfactory.

Mr. J. J. Shaw (Edinburgh) and Mr. W. M. B. Oliver (London) also entered into the subject, and showed photographs of cases and the procedures they adopted. Mr. Oliver remarked that in order to do a proper epithelial inlay it was essential to remove the whole conjunctiva and all the orbital tissue; his practice was to remove everything down to the periosteum. Also, a large mould must be used, sufficient to fill the whole cavity, and the interior surface of it should be convex, so that when sutured, the lids were tightly stretched over it. To secure a good result, the mould must be covered with one single graft.

Mr. Arthur Edmunds related his experience of cases of rodent ulcer of the face, and his method of using a sliding flap. Most of the cases depicted on the screen were those in which radium and X-rays had been tried but had failed.

Mr. T. Harrison Butler (Birmingham) spoke of the added ease and convenience secured by lubricating the razor with paroleine or sterilized olive oil. For epithelial outlays instead of using a stent he employed dental moulding wax No. 3, as this did not become hard when cold; he also used it for making moulds in cases of symblepharon. H. Dickinson, Reporter.

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TRYPARSAMID.

The ophthalmologist is interested in everything that has an action on the optic tract. Each new drug that has such a property must be scrutinized to determine whether this action is good or bad.

Tryparsamid was first used as a therapeutic agent in human trypanosomiasis by Pearce in 1921. The first reports of its employment in neurosyphilis were by Lorenz, Loevenhardt, Blechwenn and Hodges in 1924. Since then about fifteen reports on this drug have been made. All workers agree that it often has an effect on the sight. At least three articles have been concerned primarily with the effect of tryparsamid on the vision.

Woods and Moore in 241 patients found that about 10% had subjective disturbances of sight and about 5% had objective damage. They concluded that subjective trouble was not a contraindication to further treatment, but that objective disturbance was a contraindication.

Lillie's statistics showed that about 8% had subjective and 3½% objective signs of ocular trouble. These figures he claimed were better than those in which arsenic preparations other than tryparsamid were used.

The latest report, by Cady and Alvis, from which the above summary is taken, is based on a study of 180 patients with neurosyphilis treated with tryparsamid. 153 of these had no recognizable disease of the optic tract, subjective or objective, and 27 did have some such trouble. The authors concluded that the general benefit derived from tryparsamid in patients with normal visual tracts justified its use as the vision in only 1.3% was apparently injured. Patients with diseased optic tracts are more liable to visual injury as 37% of the 27 cases were made worse. They consider objective ocular disturbance as an indication for discontinuance of tryparsamid for at least one month, after which it may usually be resumed. 14% of the cases with ocular involvement were improved; and the authors point out that 62% were either improved or arrested, whereas the rule without treatment is a progressive failure of vision.

Cady and Alvis stress the fact that the last part of their series gave better results than the first part, and that other authors who reported large numbers of patients obtained better results than those who treated only a few cases, arguing from this that experi-

ence in handling the drug was an important factor of safety.

The last few years has seen the addition of many new arsenic preparations, and of this latest too little is known for final judgment. At present the function of the ophthalmologist with regard to tryparsamid seems to be advisory as to the wisdom of administration of the drug. However, the cases of ocular benefit from its use, tho few, may be ground for hope that a further study of patients and dosage may lessen the dangers and increase the percentage of cases improved; and that tryparsamid may even become a valuable therapeutic agent in optic atrophy and in neurosyphilis. Certainly a review of the literature on the subject warrants an open minded attitude on the part of the ophthalmologist rather than one of condemnation.

L. T. P.

ORIGINAL RESEARCH.

The general plan of discovery and exploration is to go as far as anyone else has gone and then to go on. Original research in ophthalmology becomes possible when one has learned all that any one else has learned upon a particular subject; and has the insight and the resources to go further into it and observe what no one else has before observed, or to see a significance in something that no one else has thought worth paying attention to.

Among the requests that come from time to time to the editor of any scientific journal of wide circulation is the request for the suggestion of "good subjects for original research." The only answer is by questions, like: What do you know? What are you interested in? What facilities can you command for original investigation. A teacher, daily watching the work of a student, seeing how much he knows of this or that, what particular questions arise in his mind, along what lines his interest seems most awakened, can make suggestions that may be helpful. But, knowing neither the inquirer, his acquaintance with what is already known, nor his interest in scientific truth, aroused by phenomona that pass before him, to attempt to give advice as to what particular problems are likely to be solved by such an unknown investigator is absurd; and the absurdity becomes manifest as soon as one attempts to comply with such a request.

It is possible for an experienced investigator to give helpful suggestions as to how to work on a particular problem, if that problem has already been chosen. He may do this either by pointing out the books and journal articles that will carry the student to the bounds of what is already known, or the obstacles that have blocked previous attempts to extend the bounds of knowledge in that direction, or suggesting methods that might be tried for overcoming these obstacles or questions that will have to be answered before progress can be made in that direction. But this kind of help must depend on the advisor's own learning and interest in that direction and his general experience in research work, joined to his knowledge of the particular person he is asked to advise.

Aptitude for original research is a congenital endowment, developed by exercise on the questions that arise in the mind of the individual from early childhood, fostered or repressed by the educational influences that surround him; and not created by an ambition to become great or famous, when he thinks his education is finished, and desires to make some particularly important and striking discovery, that will establish his reputation in the scientific world and advertise his superiority in a particular branch of knowledge.

The powers of mind that enable their possessor to deal with unsolved problems are carried by the race, to secure mastery of situations and difficulties that have to be met and solved by most individuals in their own lives. Many things are learned by imitating those around us. This is the education we get from others. But for every person situations arise, issues are thrust into his life, that he has never seen others deal with. Implanted instincts dispose of many of these. But problems remain in each life that are not solved, or difficulties that are not overcome by

instinct or imitation. These are only successfully dealt with by processes of individual consideration without guidance from others—by something allied to original research.

Powers transmitted and developed to meet the ordinary emergencies of life are best cultivated in connection with such emergencies. The physician, undertaking to study and treat diseases of the eye and its adjoining parts, finds the best opportunity to develop his powers of observation and deduction in connection with his daily cases. Twenty fail to become research workers because they are not sufficiently alert and accurate observers, to one who is kept from original observations by lack of opportunity or facilities. The seeking for some one else to set them a problem and tell them how to go to work on it, is positive proof that they lack the initiative and insight required for any important original research.

Any competent ophthalmologist may become a research worker in ophthalmology, and make valuable original contributions to ophthalmic science; but he must go at it in the right way. First, he must be interested in the subject. In daily practice one's selfish interests, of seeking financial gain and professional standing can join with all the humanitarian interest he has, and with his enjoyment of pure science, to improve his methods of examining patients, his careful recording of exact conditions present, his reading of everything that bears on such conditions, his thoughtful consideration of all he has seen and read about each case, his continued endeavor in every day's work to do a little better, understand a little more clearly and arrive at a more far reaching grasp of the facts than he ever did before. This is essentially progress in original research.

Such preparation for scientific research cannot be made without getting interested in some unsolved problem, such as faces the ophthalmologist in every case he undertakes. When he has appreciated its importance, has tried to meet it by study of all there is in the literature regarding it, feels that it is worth while to give time and effort to work out what is still unknown, or to test the relative merits of suggestions that are found in the literature regarding it; then it is time to go to someone else who is also interested in that question and ask for suggestions as to what phase of the problem to attack, what methods will be likely to overcome difficulties, what experiments may throw light on the subject.

The way to distinction as an investigator in the realm of ophthalmic science is; to get to understand the importance of controlling some pathologic condition, or clearing up some obscure point in physiologic optics or pathology. Then read about it, think about it, experiment with regard to it, observe over and over again all that can be observed of it. When it has assumed in your mind an exaggerated importance, and you have reached the boundaries of what is already known about it, with a willingness to go further to give more time and study to it than you would have thought it deserved before you got this interest, there is some chance that you can make some research in this direction that will be worth making; and that sometime, perhaps after you are dead, the value of what you have found out will come to be generally understood and appreciated by others.

In a sense the observations we make are repeated, but to some extent they are new. Each case of the most common disease of the eye is in some way different from every other case you have seen. To do justice to the patient the peculiar features of his case must be searched out and appreciated. Here is the training every ophthalmologist should get in research. Seeing the new feature of his case has practical value to that patient. In some way it makes the doctor wiser and more efficient, it keeps him interested in his work. It holds possibilities of benefit to other patients and other oculists. The research for which one is best adapted, in which he can be most helpful, from which he will gain most honor, does not deal with things far removed from

the daily routine of practice, but is right in line with it. When you get so that you see something that has been before your eyes many times before, but which no one has even seen before, you have an original observation to contribute to ophthalmic science. Nobody can tell how important it will be in future. E. J.

OPHTHALMOLOGICAL MEETINGS.

The annual gatherings of National Ophthalmological Societies in which the readers of this journal are most generally interested will be held as follows:

American Medical Association, Section on Ophthalmology, April 19-24, at Dallas, Texas.

Pacific Coast Oto-Ophthalmological Society, San Francisco, April 26-28.

Ophthalmological Society of the United Kingdom of Great Britain and Ireland, April 29th to May 1st.

Société Française d'Ophtalmologie, May 10-12, at Paris.

American Ophthalmological Society, June 14-16, at Hot Springs, Virginia.

Oxford Ophthalmological Congress, July 14-17.

The "Deutsche Ophthalmologische Gesellschaft" will this year meet with the Society of Naturalists and Physicians at Düsseldorf. The meeting for 1927 will again be held at Heidelberg.

The American Academy of Ophthalmology and Oto-Laryngology will meet at Colorado Springs, September 13-18.

Congresso Società Italiana di Oftalmologia, October, 1925.

There are other similar gatherings like those of Egypt, China, Japan, South Africa, Finland, Mexico, Argentina, and others that are of the same general character; and year by year they grow in importance. We hope to know more about them in future, and to help extend that international interest in ophthalmology and ophthalmologists, that is coming to be a real interest in the lives of many of our readers.

We believe that any English speaking ophthalmologist who has taken some part in the advancement of ophthalmic science and art would be welcome at any of these meetings; and that from any civilized country in the world, an ophthalmologist of good standing and attainments would be welcome in the gatherings of England or America. In any such gathering, anywhere, those interested in scientific ophthalmology, from any country, would receive courteous treatment and the greetings of some colleagues. Such an attitude may not be universal in any national group of ophthalmologists; but it is becoming more common and is worth working for everywhere. Marked advances along these lines have become manifest in the last year.

There are ophthalmologists traveling each year in most parts of the world. To plan a journey, so that the intellectual interest of visiting one of these annual gatherings will be attainable, along with the viewing of scenery, buildings, unfamiliar customs, and general modes of living, will add variety and zest to the whole vacation outing; and will yield some permanent benefit, thru the slightly different view gained of familiar problems. It is hoped that a more extended list may be made available to serve as a basis for such planning. Any assistance in this direction will be welcome. E. J.

BOOK NOTICES.

Helmholtz's Treatise on Physiologic Optics, Translated from the Third German Edition. Edited by **James P.C. Southall,** Professor of Physics in Columbia University. Vol. III, The Perceptions of Vision. Cloth, large 8vo., 748 pages, 6 plates and 78 illustrations in the text. Published by the Optical Society of America. Printed by Geo. Banta Publishing Co., Menasha, Wisconsin. (Also see A.J.O., v. 7, p. 886, and v. 8, p. 850.)

This volume completes the publication of the Helmholtz Treatise in English. The editor and his eminent assistants are to be thanked for, and congratulated on, the excellence of their work. Altho two pages are given over to corrigenda of the preceding volumes, the trifling character of the er-

rors thus corrected rather emphasizes the high standard of excellence attained. Almost without exception, the errors found each involve but a single letter, and could not possibly lead to any serious misunderstanding as to meaning. This volume is larger than either of its predecessors, partly because of the 46 pages of bibliographies and indexes it contains; but chiefly because the subject matter of this division of the work has grown during the last decades, so that it requires more space for its presentation. Of new matter, it contains only two notes by von Kries, less than 34 pages, that have not been published in the German edition.

The plan followed is the same as that of the earlier volumes; namely, to give first the statement that Helmholtz gave in the second edition, the last that he edited; and then to give the notes appended by von Kries in the third German edition, to bring the subject fully up to date, the new matter following the chapter it is intended to supplement. The chapter headings in this volume are: 26, Concerning the Perceptions in General; 27, Movements of the Eyes; 28, The Monocular Field of Vision; 29, The Direction of Vision; 30, Perception of Depth; 31, Binocular Double Vision; 32, Rivalry Between the Visual Globes; 33, Review of the Theories.

Each of these chapters, except 26 and 33, is followed by Notes by von Kries; those on 30 and 32 being new in this edition, the others translated from the third German edition. Then there are 8 appendices by von Kries, 92 pages; and a chapter "On the Theory of Binocular Instruments," 36 pages.

The "partial bibliography, 1911-1925," takes 16 pages, the index of subjects 17, the index of authors 10 pages. These indexes cover all three volumes, and make Helmholtz' treatise a practical and extremely valuable work of reference. This it will always be, to the great mass of ophthalmologists that possess and use it. It is not to be read thru like a textbook, either in a week or a year. Very few will use it in that way. A great many more will go to it when they need enlightenment on some particular phase of ophthalmology; and by the help of its good tables of contents and these indexes and some previous study in these volumes, most well educated ophthalmologists will find in them ideas, facts, and suggestions of great value.

We urge every reader who can, to get a copy of this work. Every medical library worthy the name must have it, among its books of reference. No one will read and master it all; but a great many practical ophthalmologists will find in it invaluable suggestions and information. No mountain climber ever has, or ever will climb all the high mountain peaks that have been scaled by man. But any healthy human being that climbs one of the summits above timberline and above the clouds or summer snow, to look down on lower peaks or spreading plains will get new ideas of the forces and beauties of nature, new conceptions of his own life and emotions. So any ophthalmologist who reads one chapter of Helmholtz' Physiologic Optics will find his whole view of ophthalmology broadened, and graced with a charm that it did not have before, some problem solved, some question answered in a way that will open new vistas of interest; and for such a service he will ever after hold this treatise in high esteem.

Take the first chapter in this volume, "Concerning the Perceptions in General." Any physician, any scientist, can read and ponder these sentences with great profit. The psychologist will gain from it a better understanding of the basis of modern psychology. The student of metaphysics will acquire a better understanding of the application of his rules of reasoning. The mathematician may get suggestions of the broader uses of algebraic formulas. Each of these will center his interest on a chapter different from those chosen by the others. But there are many aspects to ophthalmology; and in this many sided work each can find some particular interest of his own, reflected in a way that will help him to follow it to more fruitful thinking and more practical usefulness. E. J.

Das Augenzittern als Gehirnstrahlung. Ein Atlas der Augenzitternkurven. Prof. Dr. Johannes Ohm, Bottrop, Westphalia. Paper, octavo, 334 pages, 266 illustrations in the text. Berlin and Vienna. Urban and Schwarzenberg, 1925.

Twenty years ago Ohm had become interested in the disorders of the ocular movements, and five years later he had entered upon his investigations of the nystagmus of coal miners. As he tells, in his poetic "Vorwort", to a strictly scientific treatise: "In the dark womb of the earth of Westphalia lie the rocks left by ancient primeval forests that grew in the rays of a tropic sun. The winning of them is linked with death, mutilation and manifold diseases, characteristic among which is das Augenzittern der Bergleute, the nystagmus of miners.

He points out that as the coal radiates energy of varied wave lengths to furnish power, so the nystagmus reveals the outpouring of intrinsic power of the living matter of the ganglion cells of the brain. To study and explain the manifestations and significance of these nerve discharges has been a large part of the life work of this writer, and the present book presents what he has accomplished.

The inventive skill, which Ohm early showed, has enabled him to invent and adapt simple and inexpensive apparatus, for the exact observation and recording of the ocular movements. Some of the illustrations of this book represent and explain such apparatus and show the manner of using it. The majority, however, are reproductions of photographic records of eye and head movements, that have been obtained by such means.

The first fifteen pages are given to a general description of apparatus and methods used in these investigations. Then comes the bulk of the book, dealing with the special forms of nystagmus. It begins with the nystagmus of dim light—dark nystagmus; especially that of miners, to which is devoted more than 100 pages. Then follow the nystagmus of congenital amblyopia, of acquired amblyopia, optical nystagmus of movement—railway nystagmus, vestibular nystagmus, that due to organic disease, hysteric nystagmus and that occurring in extreme positions of the eyes, near the boundaries of the field of fixation, which may be called "physiologic nystagmus." Then comes part III, the theoretic consideration of the subject, 72 pages, followed by an 8 page bibliography of the literature of nystagmus.

The illustrations are mostly reproductions of the curves representing the ocular movements of nystagmus. A few represent apparatus and a few are diagrams explaining ocular relations and movements; but on the whole, the subtitle "An Atlas of the Nystagmus Curves" is appropriate. There are tables presenting the oscillations of one or both eyes in cases, as to character, frequency, extent, direction, etc. In brief, this book is a thoro treatise on its subject, nystagmus, regarded as an expression of cerebral impulses; and makes a very creditable showing of the scientific results of its author's professional life. This is the most complete, balanced, authoritative work on nystagmus now published. E. J.

Commemorazione del Priomo Centenario della Clinic Oftalmica di Pavia. Prof. Francesco Falchi of the Ophthalmic Department of the Royal University of Pavia. Paper, octavo, 111 pages, illustrated. Pavia. Tipografia Cooperative di Pavia, 1924.

When Scarpa, known to all medical students thru "Scarpa's triangle," was Professor of anatomy in Pavia there was established an Ophthalmic Clinic, of which the first Century was celebrated June 9, 1923. On this occasion the present incumbent gave an address, devoted to the achievements of his predecessors, Antonio Scarpa, Francisco Flarer, and Antonia Quaglino.

This address occupies 75 pages of the book; and is supplemented by bibliographies of the writings of each of the four Professors, who have guided the work of this department in the century since its foundation. It also contains abstracts of addresses by colleagues, and letters and telegrams, re-

ceived from students and friends on that occasion.

There is a photographed reproduction of a memorial tablet for the occasion and portraits of each of the four Professors who have occupied this chair. Scarpa wrote the best book on Ophthalmology of his day, published in 1801. Flarer came into the faculty in 1819. He was most widely known for his writings on trichiasis and corneal staphyloma. After his death in 1859, Quaglino was chosen by competitive examination. He contributed many papers to the literature of ophthalmology including the description of tobacco amblyopia. He founded the Annali di Ottalmologia in 1871. Quaglino died in 1894, and was succeeded by Falchi, whose contributions to ophthalmic literature have continued until the great War and this volume.

The history of ophthalmology has and should have interest for an increasing number of ophthalmologists. This is a valuable addition to original sources of historical information.

E. J.

Saggi di Oftalmologia, Anno 1924. Prof. Q. Di Marzio, Docente, Ophthalmic Clinic of the Royal University of Rome. Paper, octavo, 96 pages, 12 illustrations and 4 plates in colors. Rome, Stabilimento Tipografico Reginale.

This work contains six contributions to the literature of ophthalmology from the Eye Clinic of the University of Rome. Their subjects are: Vaccine therapy of gonococcus conjunctivitis in the adult; with a tabulated report of 100 cases. Posttraumatic primary glaucoma. Cylindroma of the lacrimal gland, illustrated by half tones and three colored plates. Lesions of the cornea from X-rays and from ammonia, three clinical cases. Angioid streaks of the retina, with a colored plate of the eyeground. Fibroendothelioma of the optic nerve, illustrated.

These papers all contain valuable matter which we shall draw upon for the abstract department. They are well written and would be creditable to any ophthalmic journal. They show good clinical observation, and careful study of the directly related literature; and each is accompanied by a valuable bibliography. They reflect credit on the author and on the clinic with which he is connected. We are ready to welcome contributions of this quality and from this source. E. J.

Ophthalmic Neuro-Myology, by G. C. Savage, formerly Prof. of Ophthalmology in the Medical Department of Vanderbilt University; Ex-Chairman of the Section on Ophthalmology of the American Medical Association, etc. Second Edition. Cloth, small 8vo., 39 plates and 12 illustrations. Published by the Author, Nashville, Tenn., 1926.

The subtitle of this book states that it is a "study of the normal and abnormal actions of the ocular muscles from the brain side of the question." It is well to emphasize this characteristic of the ocular movements, that they are all expressions of actions initiated and carried on by the central nervous system. The muscles are simply the tools, or appendages, of the nerves controlling them; cannot carry on or control any movement, except with nerve initiative, stimulus and guidance, either normal or abnormal.

It is more than twenty years since the first edition of this book appeared; and in that time the leading views of its author on this subject have become familiar to the close students of the ocular movements, both the usual and the anomalous. Like some other prominent treatises on eye muscles and eye movements, it gives evidence of the thought and reflections of the author on this subject; rather than new studies by dissection, laboratory experiment, or statistical massing of clinical observations.

It is written in the direct, dogmatic style, of the teacher who puts his ideas over to the student. In the present edition the principal changes are the rewriting of seven pages of the first chapter, "because of the discovery that the eye has only two axes of rotation, the vertical and the transverse. Only around one of these is effected any cardinal rotation. Oblique rotations

are accomplished around both these axes simultaneously, each axis being in motion throughout such rotation." There is also added a description of the author's monocular phorometer, perfected by De Zeng.

The chapter headings are: I. Ocular Rotations and the Muscles Effecting Them. II. The Brain Centers Controlling the Ocular Muscles. III. Ametropia and Pseudoheterophoria. IV. Compensating Heterotropia.

The book has no table of contents, but a good alphabetic index. There is also a complete table of the plates and illustrations used. Thruout, the book is an exposition of the individual views and conclusions of its author; and of these it is the best, condensed exposition to be found in any of his writings. E. J.

CORRESPONDENCE.

Test of Color Perception.

To the Editor. Dear Sir: In testing refraction I use a test card which has a green line under the 6/10 letters, and a red line under the 6/6 letters. In order to save time I request the patient to read the letters above the red line. If, instead of doing so, he reads the letters above the green line, I test his color-sense. During the past year I have detected five cases of colorblindness by this method.

Respectfully,
J. Ellis Jennings.

St. Louis, Mo.

ABSTRACT DEPARTMENT

Reprints and journal articles to be abstracted should be sent to Dr. Lawrence T. Post, 520 Metropolitan Building, St Louis, Mo. Only important papers will be used in this department, others of interest will be noticed in the Ophthalmic Year Book.

Virgillo. A Case of Sixth Nerve Paralysis Following Spinal Anesthesia. Arch. di. Ott., 1925, Vol. 32, p. 97.

In 1922 Terrien was able to collect records of 62 cases of sixth nerve paralysis following spinal anesthesia. Since his work four further cases have been reported. The author's patient, a man of 22 years of age, was operated on for varicocele by spinal anesthesia. Novocain with adrenlin was the anesthetic used. Two c. c. of 2% solution were injected. The anesthesia being insufficient, ether was also used. Severe headache and backache were noted for the next two days, and on the fourth day paralysis of the left sixth nerve was complete but recovered in six weeks under treatment by strychnin and the galvanic current. The author believes this paralysis and all paralyses of the sixth nerve following spinal anesthesia can be best explained by a selective toxic action upon the sixth nerve or its nucleus, exerted by the anesthetic itself or some of its toxic products into which it breaks up when coming in contact with the body tissues or the cerebrospinal fluid. In spite of the reaction which suggested a mild meningitis in the present patient, the author does not believe in the inflammatory theory of these paralyses since any inflammation affecting the sixth nerve would be almost sure to affect other cranial nerves. He thinks the latent period of three days before the paralysis was noted is an argument in favor of the toxic theory. Altho these paralyses have been noted to occur somewhat more frequently in patients with lues, the first patient did not have lues and it is necessary to assume some special susceptibility of certain persons to explain the relative infrequency of paralysis of the sixth nerve occuring among numerous spinal anesthesias carried out under identical conditions.

S. R. G.

Pardo. A Device for Changing Objectives in the Corneal Microscope. Arch., di. Ott., 1925, Vol. 32, p. 122.

For rapidly changing the magnification of the corneal microscope without altering the focus, the author has devised and has had manufactured by Zeiss, a rotating plate on which the three objectives are mounted. A simple turn of this plate is sufficient

to place the objective desired before the aperture of the microscope.

S. R. G.

Angelucci. The Cataract Operation in Cases of Enophthalmos. Arch. di. Ott., 1925, Vol. 32, p. 138.

Referring to a paper by Nigettich who suggests the retrobulbar injection of novocain to push the globe forward in such cases, Angelucci believes this procedure is unnecessary if the operation is carried out according to his technic. This consists in seizing the conjunctiva and a portion of the superior rectus with fixation forceps at a distance of four to five millimeters from the cornea. When these forceps are held vertically the upper lid is held out of the way by the forceps without the use of the speculum. By means of the forceps perfect fixation is obtained and the eye may be pulled slightly forward, giving plenty of room for the passage of the knife. Angelucci makes the capsulotomy with the point of his knife while making the incision and usually, especially in enophthalmic eyes, does not do an iridectomy. The forceps are left in place until the conclusion of the operation, being held in the left hand of the operator. In a few cases where iridectomy is necessary, the forceps are removed and an assistant pulls the eye down by a conjunctival fixation below the globe.

S. R. G.

Sava-Goïou, G. A New Method of Capsulotomy in Cataract Operation. Annales d'Oculistique, 1925, vol. 162, pp. 786-90.

In order to avoid secondary cataract, the author introduces a straight L shaped cystitome thru the corneal incision, advancing the point across the anterior chamber to the pupillary border of the iris at six o'clock. He then turns the point against the capsule and following the iris border completes a circle. The cystitome is withdrawn and a Kalt forceps or any toothed forceps is introduced, the anterior capsule seized and withdrawn. This comes off as a complete round piece. The usual iridectomy and expression of the lens follows. The author claims using this method he has had no secondary cataracts in 400 operations in the past three years.

L. T. P.

Heine, L. Cataract in Tetany and Myotonia. Zeitschrift für Augenheilk., 1925, Band 55, p. 1.

The author reports five cases of tetany cataract, of which four were female and one male; two had thyroidectomy. One had been operated on at 20 years old and for ten years after, the lenses had remained clear. In the other operated case, lens opacities and tetany occurred after several months.

The author also describes ten cases of myotonia cataract, of which three were female. Two patients (brothers) belonged to Thomsen's type, the remainder to the atrophic form of myotonia.

A typical slitlamp picture of either tetany or myotonia cataract does not exist, for different types of both are observed. For example in the case of a mother and son with myotonia cataract, whereas the mother showed a subcapsular opaque zone with a layer of small granules, in the case of the son there was a definite posterior cortical cataract in the form of a guard star. In tetany cataract also, the subcapsular type can exist with one to three opaque lamellae in succession or with a transparent cortex and a milky nuclear opacity. Tetany and myotonia cataract are easily distinguishable from the lamellar and senile forms.

The above fifteen cases occurred among about 130,000 eye cases showing 2,236 cataracts, so that one case of myotonia or tetany cataract was found to about 8,000 eye patients.

H. G. L.

Edeskuty, Otto. Primary Necrosis of the Iris. Zeitschrift für Augenheilk. 1925, Band 55, p. 38.

A shoemaker, 61 years old, developed without evident cause a severe inflammation in the left eye accompanied by marked aching in the head and left temple. There was no vision after the first day of the inflammation. Clinically the eye showed a dull cornea and a swollen discolored iris; many precipi-

tates were present, to which was added in a few days a fibrinopurulent exudate. The latter soon filled the anterior chamber and led to increase of tension and great pain. An anterior sclerotomy was done followed by temporary relief only; enucleation finally.

Histologically, sections from the eyeball showed three large necrotic areas in the cornea with almost complete necrosis of the iris. The type of the iris necrosis corresponds to the toxic form, in which the tissue of the iris in its primary or generally normal state had died.

The author thinks the pathologic picture resembles in every particular the necrosis, as brought out by Meller, caused by herpetic disease; this would best explain the necrosis in the cornea as well as that in the iris.

H. G. L.

Hard Paraffin Substitute for Glass Eyes. Government Ophthalmic Hospital, Madras, Report, 1924.

Owing to the difficulty of getting suitable glass eyes in India for ordinary cases, and the impossibility of having special shells blown to fit extraordinary cases such as reconstructed sockets, it became necessary to improvise. The method of taking a plaster cast of the socket and sending it to manufacturers had not proved satisfactory. Other arrangements such as keeping standard sizes and colors and despatching for matching, likewise proved impracticable. Several reconstructed socket cases had to be dealt with during the year, and after a trial of many methods, the plan of modelling a prosthesis out of paraffin (of 60° C. melting point) was evolved. A rough shape is first cut out and added to by molten paraffin or scraped down with a scalpel to suit the peculiarities of the individual socket. This is done with the patient sitting opposite, the model being repeatedly tried in position. Such a paraffin mould can then be marked out with the position of the cornea and a cast taken so that other accurate copies can be rapidly made. A colorful paper iris may be countersunk in the corneal position and there imbedded, if so desired. The main points of advantage are that the paraffin substitute maintains the shape of the socket (which is likely to contract especially in reconstructed cases), and a duplicate can be sent to the manufacturers, giving correct shape, size, and position of cornea and shade of pupil.

A full note on this subject has been published in the Indian Medical Gazette for March 1925. E. J.

Wright, R. E. Empyema of Sphenoidal Sinus with Double Optic Neuritis. British Medical Journal, 1925, v. 9, p. 597.

A female, aged 40, first came to hospital on April 17, 1923, with vision right eye, fingers at 3 meters and left eye —6/5 with correction. A subsiding papillitis with early cicatricial changes was present in the right eye; the left disc was inflamed. The cause of the condition was not determined at the time. In the ordinary routine the sinuses would have been examined when other more usual etiologic sources had been found wanting. Circumstances were unfavorable and the nose was not explored until August 16, 1924. The sphenoidal sinus on the right side was normal and small, that on the left contained pus under tension and was large. It presumably was related to both nerves. The patient showed none of the field changes usually associated with optic nerve involvement in sphenoidal sinus disease. Occipital headache was perhaps the only suggestive symptom. The sphenoidal sinus was opened and the papillitis subsequently subsided, leaving the patient with a vision of 6/6 in the left eye and fingers at 2 meters in the right eye. E. J.

Sutherland, J. M. Retrobulbar and Intraocular Neuritis Due to Hyperplastic Changes in the Ethmo-Sphenoid Sinuses. The Journal of the Michigan State Medical Society, 1924, July.

The author has made a study and dissection of 70 specimens in the anatomic laboratory, University of Budapest, Hungary, finding some rare

specimens, in one of which the optic canal passed thru a very large posterior ethmoidal cell. In about 33% of the specimens examined there was an intimate relationship between the optic nerve, the posterior ethmoidal cells and the sphenoidal sinuses. In 25% the bony partition between the canal at the sphenoid was 1/10 mm. or thinner. Dehiscences were found in only two specimens. Pathologic changes were found on the inner wall of the optic canal in three specimens; thickenings in places and evidences of chronic sinus infections.

The etiology of optic nerve involvement from sinus disease occurs (1) Thru the blood stream and lymph channels; (2) by direct extension of the inflammation or infection; (3) by pressure upon the intracanalicular portion of the optic nerve, from thickening of the bone due to periosteitis, and osteitis, or edema of soft tissue; (4) by absorption of toxins from a local cell or cells, or by toxemia from remote sources.

The diagnosis from the ocular findings is made by perimetry, which shows: (a) central scotoma, 1st for colors, later for white; (b) enlargement of the blind spot; (c) contraction of the field of vision, especially for colors; the rhinoscopic examination and the fundus examination, which shows tumefaction of the optic nerve, ranging from congestion to intraocular neuritis.

The prognosis of optic neuritis due to sinus infection depends upon the course of the infection and the proper treatment. In acute cases, prognosis is better; the symptoms may occur with rapid blindness within a few hours. Early and prompt surgical intervention gives excellent results unless some intracranial complication develops. In chronic cases the prognosis must be guarded; the final result may be irreparable from changes in the optic nerve and bony wall of the sinuses. The treatment in such cases is surgical. Even tho the patient may have lues. tuberculosis, multiple sclerosis or tabes, he may also have a chronic sinus disease, which is not relieved by antiluetic treatment and which will not have any effect upon the eye condition.

H. V. W.

Bulson, A. E., Jr. Etiology and Treatment of Endogenous Iritis. Trans. Amer. Ophth. Soc., 1925, v. xxiii, p. 292.

This is a membership thesis based on 100 cases seen in private practice. Only cases of endogenous origin are included. Cases in which the process was confined largely to the iris were used with those in which the ciliary body and choroid were involved. In many cases, the toxin from several foci of infection may have influenced the production of the iritis. But with the elimination of the most pronounced infection, the apparent cure of the patient justifies the belief that the infection removed was responsible for the eye condition.

In cases in which several etiologic factors were removed promptly, with recovery of the patient, it was impossible to determine which was most prominent in the causation of the eye lesion. On the other hand there were certain cases presenting multiple foci of infection in which lasting curative results did not occur until the last known infection was removed. The customary local and general treatments were generally crowded to obtain the maximum effect.

An analysis of these 100 cases as to etiology shows: syphilis, 33, with questionably two more credited to teeth, and two more credited to tonsils; teeth 32, including two associated with syphilis and three associated with tonsils; tonsils, 22, and questionably three more associated with teeth; gonorrhea, 5; disease of antrum, 3; frontal sinus, 1; sympathetic inflammation, 1; melanotic sarcoma, 1; undetermined, 2.

It is worthy of note, that no cases of iritis could be traced to infections in the gastrointestinal tract, nonvenereal genitourinary conditions, skin, ear, kidney, liver diseases, or from such diseases as pneumonia, influenza, typhoid fever, or any of the exanthematous diseases, tho ophthalmic literature often

mentions iritis as due occasionally to one or more of these causes.

The syphilitic cases occurred at all ages and in all stages of the disease. When present, syphilis was accepted as the predominating causative factor, even in the face of other possible foci of infection that might be responsible for the iritis, and antisyphilitic treatment in nearly all of such cases was effective. However, there were a few cases in which the patient showed syphilitic manifestations, in which antiluetic treatment had only a modifying effect; and the most satisfactory results followed subsequently, by the removal of tonsils, teeth, or other foci of infection. Such cases were not credited to syphilis.

Of the iritis cases attributed to diseased teeth, 32 and questionably one or two more, 21 were over fifty years of age, and with the exception of 4, all were over forty years of age. Teeth, considered as possible etiologic factors, showed infection visible, or demonstrated by radiographs. In two cases, an attack of iritis seemed to have been precipitated by extraction of bad teeth.

The tonsils furnished 22 cases of iritis, and perhaps three others. All of these cases were under forty years of age, and 13 were between twenty and thirty years of age. In 3 young adults, who present no other marked cause for the iritis than diseased tonsils and adenoid tissue in the nasopharynx, recovery was prompt and satisfactory following a tonsil and adenoid operation, and so far as known no further attacks of iritis were experienced.

Five cases of iritis were proved rather definitely to come from gonorrhea and were benefited by gonorrheal vaccine. The antrum seems to have been the cause of iritis in three cases, and the frontal sinus, melanotic sarcoma of the choroid, and sympathetic inflammation each gave one case of iritis.

It was noted that there was less pain in the cases due to syphilis; whereas those due to infection of the teeth or tonsils seemed to produce the greatest amount of discomfort. It also was noted that in the syphilitic cases, the inflammation was apt to be more pronounced in the iris; whereas in many of the other cases the ciliary body was more involved.

The local treatment was always the recognized treatment for iritis, and consisted in ad maximum doses of cycloplegics and dionin, and using moist hot compresses. It was discovered that subconjunctival injections of atropin proved more efficacious in breaking up adhesions than the topical applications of solutions of atropin. Dionin also proved more effective when administered subconjunctivally.

For the relief of pain, and in bringing about early beneficial effects in the condition of the eye, nothing was found equal to the intravenous injection of sodium salicylat in thirty to fifty grain doses. Oftentimes, the salicylat was combined with sodium iodid and in those cases in which the iodids seemed indicated to promote absorption of exudates, the intravenous use of sodium iodid in doses of thirty to fifty grains proved most efficacious.

For frankly syphilitic cases, neosalvarsan intravenously was administered in a large proportion of cases, and generally in direct connection with mercurial inunctions and oftentimes iodids as well. Deep mercurial injections were tried, but found to be no more satisfactory, and usually less so, than mercury by inunction. The cases of gonorrheal iritis showed marked benefit from gonorrheal vaccines, tho each one of these particular cases obtained marked relief thru the intravenous use of sodium salicylat.

In this series of cases, the history of a large percentage of the cases was followed over a sufficient length of time, in some instances several years, to justify definite conclusions. The greatest difficulty was encountered in separating the cases of iritis due to dental infection from those due to tonsillar infection. As a usual thing if both tonsils and teeth were infected they both were given prompt attention, often at the same time. Private patients want results, and in the quickest and most effective way. Consequently it was but natural to analyze the

clinical findings and begin treatment by eliminating what seemingly is the most probable cause of the trouble.

Syphilis, causes approximately 33 per cent; dental infections, approximately 33 per cent; and tonsillar infections, approximately 20 per cent. It is thus seen that the mouth furnished over 50 per cent of the cases. It generally is possible to determine with reasonable certainty which infection is the active one in producing the eye involvement. The history of the case together with a careful examination for foci of infection will prove suggestive as to the real causative factor or factors which must be removed. In few, if any cases should a blood Wassermann be omitted, and not infrequently a provocative Wassermann will be required. E. J.

Lutz, Anton. Intravenous Administration of Drugs in Ophthalmology with Special Reference to the Use of Urotropin. Van Graefe's Archiv für Ophthalmologie, 1925, vol. 115.

The author calls attention to the general advantages of the intravenous administration of drugs and points its particular indication in diseases of the posterior segment of the eyeball, which are set up almost exclusively by way of the blood and should be preferably attacked by the same route. The most important drug in this connection is urotropin which, as Takats has shown, is effective wherever the inflammation is recent enough to provoke a local acidosis for the liberation of formaldehyd, that according to Remele and Soto appears immediately in the aqueous with the liberation of formaldehyd after an intravenous injection.

The author has utilized intravenous injections of urotropin extensively in a variety of conditions since May 1913, either alone or in combination with sodium salicylat or sodium iodid, with surprisingly gratifying results. In only two cases, at the height of the Cuban summer which induces extensive perspiration and consequent oliguria, did he observe cystalgia following its use.

Phenomenal success has attended the use of urotropin in the following conditions at the hands of the author:

A case of diffuse phlegmonous swelling of the frontal and periorbital regions, following a nail scratch of the inner canthus, with pyrexia, drowsiness and other symptoms pointing to a severe infection and an imminent orbital thrombophlebitis, subsided in 24 hours, after two injections, with formation of a small abscess at the site of infection, and was entirely well in 8 days. A similar case was cured in 4 days one year later. Hordeoli interni were aborted in a few hours when seen the first or second days. The results are, of course, less striking once pus has formed.

In a man with herpes corneae febrilis whom the author had treated twice before in the usual manner for milder attacks lasting 3 to 4 weeks, six injections produced a cure in one week. A case of acute iritis with extraordinary photophobia making examination impossible until after first injection, was cured completely after 8 injections.

The most instructive case was that of a severe infection arising on the fourth day after cataract extraction as a result of the bursting open of the anterior chamber from vomiting on the third day. The eye looked hopeless. Three injections caused the disappearance of the hypopyon and four weeks later (8 injections had been used in the first eight days) the eye was free from all irritation with V=5/6. In a case of uicus serpens with one-half of the cornea destroyed and one-third of the anterior chamber filled with hypopyon, cauterization, irrigation and urotropin injections stopped the process in five hours with disappearance of hypopyon in 48 hours and cured in three more days (6 injections) with only a slight scar.

Brilliant results were obtained in choroiditis not only as far as visual acuity and shortening of duration of disease from months to weeks were concerned, but in the demonstrable fundus picture, which showed very little pigmentation and small tissue damage afterwards. The severer the tissue reaction the more striking is the result.

One case with two patches below the papilla, of four days duration, was cured in three weeks. Another case with macular patches in both eyes, of one year and three months duration respectively, recovered in three months a vision of 5/9 from 5/60 in the poorer eye, and 5/4 from 5/36 in the better eye.

A case with old central choroiditis, vision ½ in the left eye, and a severe impairment of vision in the right eye of fourteen days duration (had to be led to the office), recovered 4/6 vision in six weeks. In a patient with iridocyclitis, deposits on Descemet's membrane, heavy pupillary exudate and pronounced vitreous opacities, of non-syphilitic character, vision rose from hand movements to 5/9 in two months.

Unfavorable results were observed as well, but only in absence of recent tissue reaction.

Two excellent results were obtained in optic nerve affections. One was that of a woman with a history of amenorrhea, and vision rapidly sinking to only counting fingers at one meter. She had retinal hemorrhages, papilledema of four diopters elevation and temporal hemianopsia. After one week of urotropin treatment menstruation was reestablished and an abscess appeared in the leg. Two weeks later her vision was 5/9 and fundus completely normal. The other case was a nephritic patient with blood pressure of 180, severe headaches and vision reduced to fingers in the right eye. Fundus showed bilateral neuritis of three diopters elevation, retinal hemorrhages, and white spots. In seventeen days vision was 5/9, which increased later to 5/6 tho in the fundus the elevation of the papillae and filiform vessels remained. Another similar case failed to respond and blindness resulted in three months.

No favorable results were observed in glaucoma, but the author was surprised to find in a case which had urotropin administered as a preliminary to an iridectomy, that the aqueous was clotted, and was found in the wound the following day in the form of a mucous shred. M. D.

Steindorff, K. Eye Disturbances After Poisoning by Veronal and Allied Soporifics. Deutsch. medicin. Wochenschr., 1925, vol. 51, pp. 1565-1567.

According to Steindorff, there is nothing characteristic or diagnostic about the eye changes in poisoning by these soporifics. The condition of the pupils in veronal poisoning varies. In the very severe and fatal cases, they are small and do not react to light. A similar change is observed in luminal poisoning. True hippus is seen in cases of relatively severe poisoning by veronal, luminal, and adalin, and also in carbon bisulphid, amylene hydrat, and chloral hydrat intoxications. The most persistent symptom of veronal, luminal and trional poisoning is oscillatory nystagmus, which may be horizontal, vertical, or rotatory, is of central origin, and has no diagnostic characteristics. During convalescence from veronal poisoning, there have been observed ptosis, paralysis or weakness of accommodation, and paralyses of the external eye muscles, of conjugate movements, especially upwards, and of convergence. Oppenheim believes that there is in these cases an injury to the gray matter in the midbrain. Exanthems on the lids and loss of the conjunctival and corneal reflex have been noted.

Severe and lasting visual disturbances after veronal poisoning are apparently very rare. Oppenheim, Gutman, and Ungar have reported cases of blindness in the presence of normal fundi. They all considered the blindness to be of psychic or hysteric origin. Hallauer's patient went blind suddenly in the course of chronic veronalism and later developed optic atrophy. In Terrien's case, after the ingestion of 2.5 grams of veronal, there developed a bilateral mild neuroretinitis, and marked reduction of vision with slight concentric contraction of the visual fields and small central scotomata for colors. The patient made a rapid and complete recovery. H. P. W.

Terrien, F. Neuroretinitis and Amblyopia from Ingestion of Veronal. Arch, d'Ophtal. 1924, vol. 41, pp. 204-206.

Terrien reports a case of mild neuroretinitis with marked reduction of vision following the ingestion of a relatively small dose of veronal.

A woman, 39 years of age, took 2.5 grams of veronal and a decoction of poppy heads, two heads to the cup, with suicidal intent. Within a few minutes, she lost consciousness. About twelve hours later, she was admitted to the hospital in a semicoma which gradually became complete. On regaining consciousness, she complained of weakness, digestive disturbances, vertigo, and loss of vision. Six days after the ingestion of the poison, her vision was found to be O.D. 2/10 and O.S. 3/10. The visual fields showed slight concentric contraction for form and colors and a small relative central scotoma for 1 to 1.5 mm. color test objects. The pupils were slightly miotic and reacted sluggishly to light and in convergence. The ocular rotations were normal, but convergence was limited. Examination of the fundi revealed slight blurring of the discs with haziness of the margins and a mild edema of the peripapillary retina especially nasally. Within sixteen days, the edema of the discs and retinae had disappeared and the vision was practically normal in each eye.

Terrien believes that the fundus and visual changes were caused by the veronal and not by the opium taken at the same time. H. P. W.

Kandaswami, A. Causes of Proptosis. Government Ophthalmic Hospital, Madras, Report, 1924.

A considerable variety of interesting cases of proptosis were seen in the outpatient department including:

Lymphosarcoma. Male, age three months, was admitted to hospital on April 7, 1924, for a markedly proptosed condition of the left eye. The exposed conjunctiva was inflamed and granulomatous and the vessels dilated, not unlike an inflammatory condition. On exploration a clear fluid was obtained which proved to be cerebrospinal fluid. The case was one of lymphosarcoma which presumably connected the orbit with the cranial cavity. The child was taken away from hospital and the further history is unknown.

Frontal sinus suppuration. K., age 50 years, was admitted with a moderate proptosis of the left eye, conjunctival congestion and chemosis and tenderness of the orbital rim. On examining the left side of the nose no obvious sinus discharge was observed, but on examining the right side pus was found draining from the ostium of the frontal sinus. It was ascertained that the sinuses communicated across the middle line. The left sinus was drained intranasally with complete subsidence of the proptosis.

Proptosis due to passive congestion. Female, age 60 years, was admitted for a moderate proptosis with a marked chemosis of the left eye. The patient said that it had come on gradually and without pain. The condition was obviously one of passive congestion and did not in any way suggest inflammation. On palpation over the lid a slight pulsation was felt as compared with the opposite side, and a loud bruit was audible with the stethoscope. The patient did not give a history of having had an injury, fall or fainting fit. An X-ray photograph showed that distinct calcareous changes of the internal carotid had taken place. The blood pressure was 160 mm. of mercury and marked arteriosclerotic changes were noticed in the retinal vessels. After the woman had been in hospital for a fortnight without appreciable change in the left eye, the right eye became very congested and slightly chemotic. Patient was discharged at her own request.

Fibroma of the orbit. Female, age 6 years, was admitted with extensive proptosis of the right eye. The globe was displaced downwards and inwards. A rounded tumor was felt in the superior temporal region of the orbit. A Krönlein procedure was adopted to expose the growth which was found to be a fibroma about the size of a tangarin orange and attached by a narrow pedicle to the sclera near the optic nerve.

It was shelled out and the eye returned into apparently good position. Owing to the stretching of the external rectus, however, an internal squint remained, which was slowly improving.

Hyperplasia of abnormally placed lacrimal gland. A male, age 60 years, showed moderate proptosis of the right eye, the globe being pushed inwards and upwards. A firm mass was felt in the lower temporal quadrant of the orbit, but there was no evidence of inflammation. On exploration it was found that the lacrimal gland was not in its usual position and that the inferior temporal quadrant was occupied by a large mass of lacrimal gland tissue which extended towards the apex of the orbit. The patient gave a history of a severe blow on the eye, but whether this has anything to do with the case is doubtful. There appeared to be an abnormal location of the lacrimal gland tissue which had undergone hyperplasia.

Gliomata. Several cases of this condition were observed to give rise to proptosis. In a recent case a large fungating mass of the left eye was associated with a small intraocular growth on the right side which within a week of the exenteration of the left caused a rapid proptosis of the right eye due to extension thru the sclera.

Syphilitic periostitis. This is one of the most frequent causes of slight proptosis met with here. G. I., Hindu, male, age 58, had ptosis for six months and headache occasionally. For three days before his admission he had noticed his left eye gradually bulging. He gave a history of syphilis and the Wassermann was positive. Quiet neuritis was present in each eye. Movements of the eye muscles were restricted. Proptosis disappeared under the action of antisyphilitic treatment.

Cavernous angioma. A young Hindu, male, had slight proptosis and a fluctuating swelling in the inferior nasal quadrant with free discharge of pus from the puncta. The sac apparently could not be emptied. He was sent to the theater for extirpation of the lacrimal sac, but on exploration with a needle before operation, a cavernous angioma was detected. This is an interesting case from a point of view of differential diagnosis. It was at first mistaken for a suppurative sac condition, but on the table it was realized that there were complications; rhinosporidial polyp of the sac was suspected—hence an exploration was made.

Retrobulbar infection. A young man had headache and defective vision, right eye, for 15 days, with slight pain on movement and tenderness of the globe. The proptosis was just perceptible. R.V. = P.L., fundus normal. No tenderness of the orbital rim was felt, or evidence of sinus disease detected by exploration, or X-ray. The teeth were healthy. Large septic tonsils suggested a possible etiology. He rapidly improved while under observation.

Panophthalmitis. Occasionally a case of panophthalmitis shows such marked proptosis as to suggest that there is tumor behind the globe. The history frequently does not help. Several such cases were explored at the time of evisceration to exclude such a possibility. In one case a cysticercus was found in the orbital apex. Eviscerated proptosed eyes are occasionally sent to us. In one such case there was large gliomatous extension in the optic nerve.

Pyemic abscess. Male, age 22 years, transferred from the General Hospital for proptosis of the right eye, of 25 days duration. The patient had an abscess in the left buttock, subsequently his right eye began to bulge. Later on he developed abscess in the right iliac region and the left arm. The orbit was explored, pus was found and the abscess drained. Proptosis had practically subsided at the time of discharge, but his vision was only perception of light.

Nasal Papilloma. Female, age 40 years, was admitted for proptosis of the right eye, of 1½ months duration. On admission the right eye bulged 6 mm. beyond the left. The movements of eyeball were free. V. = 6/9. The pupils were active and the eyegrounds were normal. The right nostril was distended with a large mass, which

bulged towards the orbit. It was suspected to be rhinosporidium. The patient stated that the polypus started four years previously and had steadily increased in size. She had a chronic nasal discharge. The growth was removed intranasally. On section it appeared to be papillomatous. Proptosis disappeared and the patient was discharged.

Proptosis following a blow, probably due to hemorrhage. Female, age 30 years, admitted for ecchymosis of conjunctiva, right eye, with slight proptosis and limitation of movement of the eye, of 10 days duration. V.R. = 6/12; L. = 6/6. Right pupil dilated and sluggish. She gave a history of a blow with a fist ten days before. Ophthalmoscopic examination showed papilledema. After fifteen days the proptosis had disappeared completely and the pupil reactions returned to normal.

There were also seen:

Mikulicz syndrome cured by X-ray. Proptosis associated with tenonitis and cellulitis, due to irritant subconjunctival injections; subsiding without suppuration. Inoperable sarcomata of large size responsible for marked proptosis, were seen on several occasions. Cavernous sinus thrombosis. Hydatid cyst of the orbit. Fronto-ethmoidal mucocele. Diffuse streptococcal cellulitis without pus formation.

It is remarkable that not only in the past year, but in the last five years we have not seen a case of Graves' disease in the out-patient department (approximately 100,000 patients were seen in this time). E. J.

Neame and Wajid Ali Khan. Glaucoma Secondary to Choroidal Sarcoma. The Treatment of Painful Blind Glaucomatous Eyes. Brit. J. Ophth., 1925, December, vol. ix, No. 12.

The authors investigated the incidence of new growth of the choroid in glaucomatous eyes that were excised at Moorfields' Hospital during a period of eleven years. A brief abstract is given of the history, clinical and pathologic examination, together with a drawing of each of the sixteen sectioned eyes.

To summarize: (1) Of 402 eyes excised on account of glaucoma, approximately 10 per cent were found on pathologic examination to contain a choroidal sarcoma; 4 per cent were blind glaucomatous eyes in which there appears, from the clinical notes, to have been no suspicion of the existence of a new growth.

(2) Of these 16 cases of sarcoma of the choroid, 13 were spindle celled, 3 were round or polygonal celled; 12 were pigmented and 4 possessed but scanty pigment or were unpigmented.

(3) The average age of 14 of the 16 cases at the time of excision was 57 years, the maximum 69 and the minimum 39 years. No assistance is to be obtained, in the matter of diagnosis, from a consideration of the age of the patient. In this series, the average age was well above the average age of appearance of sarcoma of the choroid (from 44.2 to 48.7 years) and near the middle of the age period of onset of congestive glaucoma (from 50 to 70).

(4) The treatment of cases of blind painful glaucomatous eyes should be enucleation, especially if the glaucoma is unilateral, excepting in a few cases in which the media of the eye are sufficiently transparent to enable examination of the fundus oculi to be made. In such cases, if there be an obvious anterior detachment of the retina and if the presence of a new growth is not suspected or is doubtful, one of two procedures may be adopted as a preliminary to further surgical treatment:

(a) Scleral puncture into the space external to the detachment and ophthalmoscopic examination to ascertain whether the detachment (or retinal cyst) has diminished in size.

(b) Dissection of a scleral flap, with its apex placed anteriorly, made over the site of the detachment. Very cautious dissection and elevation of the flap is essential in order to avoid damage to a choroidal sarcoma, if one be present, and dissemination of growth cells. D. F. H.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply news from their respective sections: Dr. H. Alexander Brown, San Francisco; Dr. Wm Thornwall Davis, Washington; Dr. Gaylord C. Hall, Louisville, Ky.; Dr. George F. Keiper, LaFayette, Indiana; Dr. J. W. Kimberlin, Kansas City, Mo.; Dr. George H. Kress, Los Angeles; Dr. Edward D. LeCompte Salt Lake City; Dr. W. H. Lowell, Boston; Dr. G. Oram Ring, Philadelphia; Dr. Charles P. Small, Chicago; Dr. G. McD. VanPoole, Honolulu.

DEATHS.

Dr. Edward J. Eberle, Brooklyn; aged fifty-nine, died December 18.

Dr. Nels Christian Nelson, Eugene, Oregon, aged fifty, died November 1.

In Italy the death is announced of Drs. Feruccio Tartuferi, Alessandro Alfieri and Giovanni Perna.

Mrs. Harriet L. Green, aged 85, widow of the late Dr. John Green, pioneer oculist of St. Louis and mother of Dr. John Green, Jr., died at her home, January 25, 1926.

SOCIETIES.

At the fifth session of the Health Board of the League of Nations, different members of the board were directed to prepare preliminary reports on the frequency of trachoma, and the means to control it adopted in other countries.

The Pacific Coast Oto-Ophthalmological Society will meet in San Francisco on April 26, 27 and 28, 1926. The American Board for Ophthalmic Examinations and the National Board of Examiners in Oto-Laryngology will conduct examinations at that time.

The Section on Ophthalmology of the College of Physicians of Philadelphia met Thursday evening, January 21. The program was participated in by Drs. Warren S. Reese, Luther C. Peter, Francis H. Adler, Hunter H. McGuire, and Burton Chance. An ophthalmoscope used by Dr. Wm. F. Norris was presented.

The annual meeting of the Ophthalmological Society of the United Kingdom will take place at the Royal Society of Medicine, London, April 29, 30 and May 1. Subjects for discussion are: "Birth Injuries of the Eye" and "Intra- and Extraocular Melanomata." The annual dinner will be held at the Langham Hotel, Thursday, April 29. A visit to the National Physical Laboratory at Teddington has been arranged for Saturday afternoon, May 1.

The ninth annual meeting of the Indiana Academy of Ophthalmology and Oto-Laryngology met at Evansville, Indiana, January 20 and 21, at the Hotel McCrudy. Dr. M. Ravin was the presiding officer and Dr. D. S. Adams secretary. The meeting was largely attended and was a success from every standpoint. The officers elected for the coming year were: President, Dr. La Fayette Page, Indianapolis; Vice-President, Dr. L. D. Brooks, Evansville; Secretary, Dr. Samuel F. Adams, Indianapolis.

At a well attended dinner given to Professor George E. deSchweinitz by the Ophthalmological and Oto-Laryngological Section of the Cleveland Academy of Medicine at the Union Club, December 18, 1925, the guest of the evening addressed the Section on "The Relationship of Focal Infections in Ocular Diseases." The same evening Prof. deSchweinitz spoke to a large gathering of medical men at the annual meeting of the Cleveland Academy of Medicine. The subject was "In the House of Medical Interpretations" and was profusely illustrated with stereopticon views.

At the convention of English Speaking Ophthalmological Societies held in July, 1925, a resolution was passed empowering their president, E. Treacher Collins, to appoint a committee of five to obtain, if possible, the cooperation of delegates from the national ophthalmologic societies in the promotion of an International Ophthalmological Congress and other matters of international ophthalmologic interest. The following have agreed to serve on this committee: Dr. Edward Jackson, Denver; Dr. George E. deSchweinitz, Philadelphia; Sir John Parsons, London. By the resolution Mr. Collins was made chairman of this committee.

The Società Italiana di Oftalmologia convened recently in Rome, under the presidency of Prof. Cirincione. A number of prizes were awarded for ophthalmologic research. The Cirincione international prize was awarded to Dr. C. Déjèan for his anatomic and embryologic studies on the hyaloid membrane of the eye in mammals. The Cidonio national prize was bestowed on Professor Cattaneo for his researches on tuberculosis of the choroid. The Colangeli prize was assigned to Dr. Seullica for his article on the anatomic basis of the perimetric findings, with reference to the blind spot in the human eye. The prize for the best researches on the anatomy of the eye was granted to Prof. Versari, professor of anatomy in the University of Rome. Lastly, the prize offered by the Annali di Ottalmologia e Clinica Oculistica was awarded to Prof. Favadoro for his clinical and experimental researches in traumatic glaucoma.

PERSONALS.

Dr. J. F. Dickson of Portland, Oregon, is spending the winter in Berkeley, California.

Dr. A. B. Middleton of Pontiac, Illinois, has gone to his winter home in Florida.

Dr. M. L. Folk has been appointed Associate in Ophthalmology in the Michael Reese Hospital, Chicago.

Dr. Willis O. Nance of Chicago has gone to California for a month. He will then

start at once for a trip around the world.

Dr. M. Paul Motto was recently appointed associate consulting ophthalmologist to the Rainbow Hospital, Cleveland, Ohio.

Dr. David L. Tilderquist, Duluth, has been elected president of the Minnesota Academy of Ophthalmology and Otolaryngology.

The honorary degree of LL.D. has been conferred upon Mr. Priestley Smith by the University of Birmingham, England.

Dr. William A. Fisher of Chicago is making another trip to India. In Spain he will be joined by Barraquer who will accompany him to the different eye clinics.

Dr. Ralph A. Fenton and Dr. Irving M. Lupton have moved their offices to 806 Medical Arts Building, Tenth and Taylor Streets, Portland, Oregon.

Dr. Cassius D. Wescott and Dr. Virgil Wescott announce the removal of their offices to 2020 Garland Building, 58 East Washington Street, Chicago, Illinois.

Dr. Brown Pusey, who has been the head of the department of ophthalmology of Northwestern University for the past seventeen years, tendered his resignation on December 15.

Dr. F. M. Fernandez, Havana, was the guest of honor at a banquet of the Paris-Latin America Association at Paris. He is professor of ophthalmology, editor of the Crónica Medico-Quirúrgica and presided at the last Cuban Medical Congress.

Dr. W. H. Snyder, Toledo, Ohio, has been spending a vacation in the Hawaiian Islands. He gave an interesting talk on Problems of Modern Hospitals and the Ethical Practitioner, before the Honolulu County Medical Society at its monthly meeting, January 6, 1926.

The following postal card has been received from Dr. Casey Wood, dated November 26, 1925, Kandy, Ceylon: "As you see, we still linger in this lovely country, to make ourselves better acquainted with its flora and fauna. Next February we leave for Kashmir to spend the summer of 1926 on a house boat on the Thelma and in camping on the foothills of the Himalayas. Then home; so that we may see you some time in 1927. The George Simmons are off to South Africa, but the Giffords join us in January for a month or two."

THE LESLIE DANA MEDAL.

Mr. Leslie Dana, on retiring as chairman of the Missouri Commission for the Blind in 1925, established a special fund, to be utilized by the Missouri State Association for the Blind for the annual purchase of the Leslie Dana Medal for the Prevention of Blindness. In accordance with the terms of the gift, the National Committee for the Prevention of Blindness is to make the annual award under the following conditions:

a. Long meritorious service for the conservation of vision in the prevention and cure of diseases dangerous to eyesight.

b. Research and instructions in ophthalmology and allied subjects.

c. Social service for the control of eye diseases.

d. Special discoveries in the domain of general science or medicine of exceptional importance in conservation of vision.

Nominations will be received by the National Committee together with detailed information prompting the nomination until the 15th day of March, 1926.

The medical profession and ophthalmological societies are invited to submit names of persons deemed worthy of this honor, under the conditions set forth above, to the National Committee for the Prevention of Blindness, 370 Seventh Avenue, New York City.

MISCELLANEOUS.

The Home for Blind Children, New York, was left $500 by the will of Mary Golden.

The Brooklyn Home for the Blind was left $1,000 by the will of the late Magdalena Lett.

The New York Association for the Blind was left $25,000 under the will of the late Lewis B. Woodruff.

The Committee on Medical Education of the New York Academy of Medicine has prepared and published a synopsis of approved opportunities for graduate study of ophthalmology in New York City. A bureau of Clinical Information is maintained at the Academy where detailed information is available.

The University of Rochester Medical School, which is in its first year of work, opened its hospital January 1 with a staff composed of the leading physicians of Rochester. Dr. Albert C. Snell is chief of the department of ophthalmology. This school and hospital were founded thru the generosity of George Eastman, John D. Rockefeller and other philanthropic citizens. Rochester looks forward to a prominent place in medical educational affairs.

The Hadley Correspondence School for the Blind, whose aim it is to make the blind as nearly as possible a normal part of the community, has achieved this purpose to a remarkable degree in the few years of its existence. There are at present 598 students enrolled, taking 935 courses of instruction. The enrollment represents every state, the Philippine Islands, Canada, China, India and Australia. One interesting feature of the educational opportunities offered, is the announcement that the New York Life Insurance Company asked the School to get out a Salesmanship course and is paying $700 for this. A Federal Government appropriation has been made available for all pupils of the correspondence school who are of school age. The last sum received from this source, to be expended for text-books, was $480; and the appropriation will be made annually, the amount depending upon the number of pupils enrolled. Dr. E. V. L. Brown is the chairman of the Board of Trustees.

Current Literature

These are the titles of papers bearing on ophthalmology. They are given in English, some modified to indicate more clearly their subjects. They are grouped under appropriate heads, and in each group arranged alphabetically, usually by the author's name in **heavy-faced type.** The abbreviations mean: (Ill.) illustrated; (Pl.) plates; (Col. Pl.) colored plates. Abst. shows it is an abstract of the original article. (Bibl.) mean bibliography and (Dis.) discussion published with a paper.

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